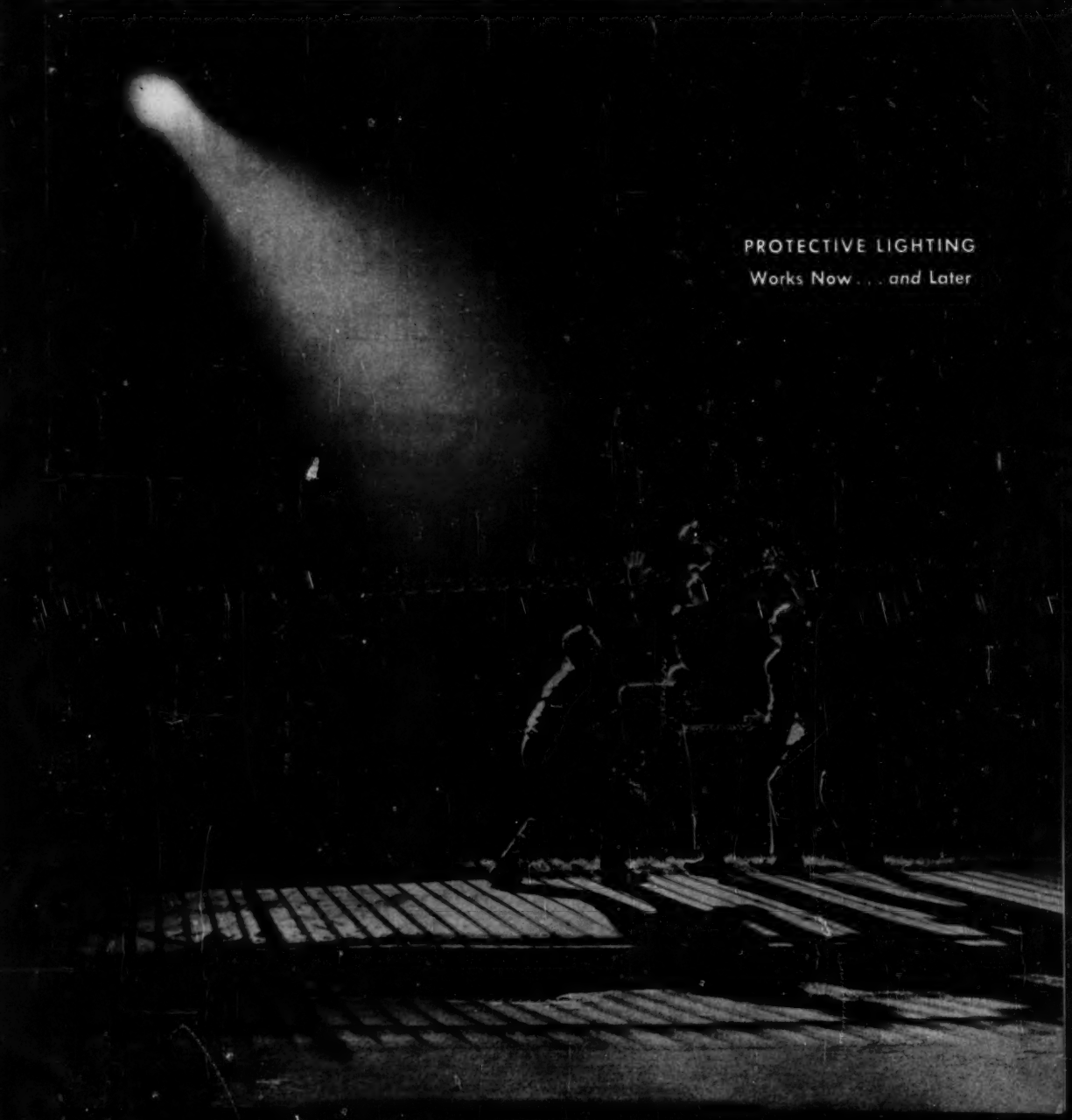
JULY 2, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



PROTECTIVE LIGHTING
Works Now . . . and Later

Year After Year

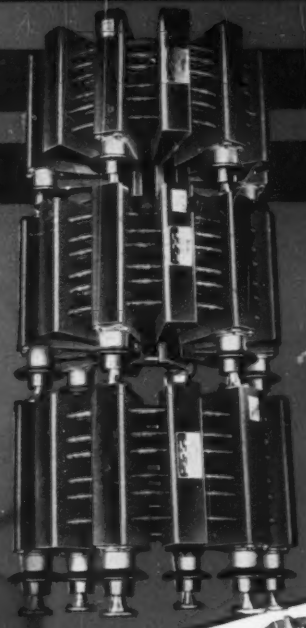
You Can Count On

Dependable Circuit Protection

WITH

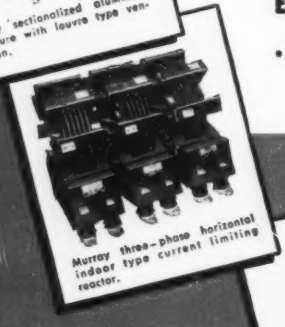
Murray

CAST-IN-CONCRETE
Current-Limiting Reactors



Typical Murray three-phase vertical outdoor type cast-in-concrete current limiting reactor.

Murray sectionalized aluminum enclosure with louvre type ventilation.



Murray three-phase horizontal indoor type current limiting reactor.

Murray single-phase completely cast-in-concrete vertical outdoor type reactor.

Murray pole top reactor.

Engineered to your specifications...
...for indoor or outdoor service.

Feeder
Generator
Motor Starting
Neutral Grounding
Transformer Equalizing
Special Purpose
Station Tie
Bus Tie
Shunt
} Reactors

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...specify Murray

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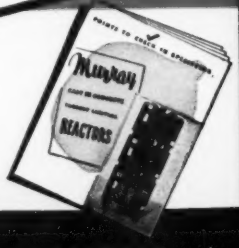
MURRAY MANUFACTURING CORPORATION

50 Years of Service to the Electrical Industry

1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

To help you give detailed information on reactors for your individual application, this comprehensive folder has been especially prepared. It provides a reliable guide to points to check in specifying all types of cast-in-concrete current limiting reactors. Write Murray for your copy today.



SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS'NEST AERIAL LADDERS

LIGHTING EXPERT

Protective lighting of key production areas is one of the thousands of problems created by an emergency like we're now facing.

It's entirely possible to install protective lighting equipment which can be converted to other uses after the emergency is over.

How to do it is explained in this issue by Albert H. Clarke, commercial vice-president of Crouse-Hinds' Illumination Department.

We don't know exactly how long Al Clarke has been prominent in industrial illumination circles, but Bob Blatt, Electrical World Associate Editor, has known him for more than 25 years. They met when Blatt was a lighting engineer at Potomac Electric Power Co., in Washington.

During World War II Bob Blatt was chief airport lighting engineer for C.A.A. He and Clarke worked

ALBERT H. CLARKE

together on many lighting committees. Clarke is an energetic worker in industry organizations, taking special interest in the I.E.S. Committee on Aviation Lighting.

His biggest hobby is his job. According to Blatt, he has probably done more than any other individual to advance protective lighting, floodlight lighting of hazardous areas, and airport lighting. He has personally designed and developed new equipment for all of these jobs.

Next to his job he's interested most in photography, specializing in dramatic landscape and industrial prints. He wins plenty of camera club prizes for his enlargements.

When we needed a photograph for this week's cover, Bob Blatt wrote Clarke, explaining our problem.

Clarke set up the fine shot you see on the cover and had one of Crouse-Hinds' artists prepare a rough sketch, which he sent in for approval before posing and taking the picture.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

Vol. 136 No. 1 — July 2, 1951

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against the two major enemies of cable life . . .

MOISTURE and HEAT

with

WATERTITE-HAZAPRENE® CABLES

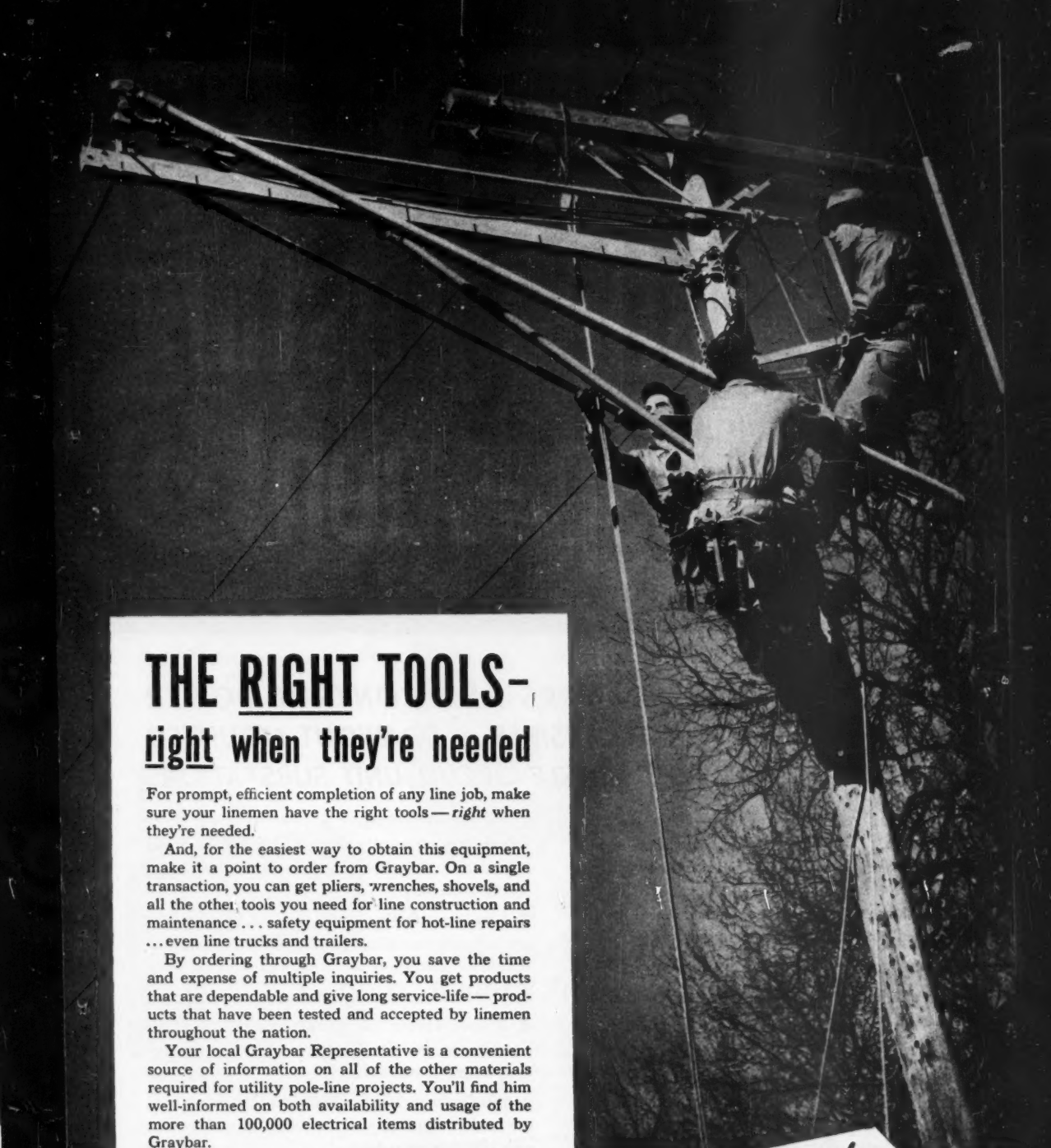
Watertite insulation and Hazaprene sheath are now teamed up in one cable to give you a simple, sure answer to the bulk of your electrical circuit requirements.

What's so good about Watertite insulation? It has a service record that goes back 20 years. Millions of feet of Watertite rubber-insulated cables have been buried underground or installed under water. These non-leaded cables continue to deliver safe, trouble-free service. Watertite insulation is compounded especially for *maximum moisture and heat resistance* at no sacrifice of electrical and physical properties.

What's so good about a Hazaprene ZBF Sheath? Ask a mining engineer who's responsible for safe, trouble-free electrical circuits despite the tough operating conditions he's up against. The Hazaprene ZBF Sheath was originally developed by Hazard to bring a new high standard of performance to mining cables. It's proved in service to have the highest resistance to oil, acids, chemicals, *moisture*, weather-exposure and mechanical abuse. ***And Hazaprene is flame-resistant*** – more than meets federal and state mine safety requirements as well as those of the National Electrical Code.

Permanently bonded together, the Watertite insulation and Hazaprene Sheath form one solid wall of protection against heat and moisture. It will well repay you to investigate the advantages of Watertite-Hazaprene Cables for your circuit requirements. A complete range of sizes up to 2,000,000 CM and for service up to 5000 volts meets most needs. Get the whole story from your Hazard representative, or write today to the Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD insulated wires and cables for every electrical use



THE RIGHT TOOLS—
right when they're needed

For prompt, efficient completion of any line job, make sure your linemen have the right tools — *right* when they're needed.

And, for the easiest way to obtain this equipment, make it a point to order from Graybar. On a single transaction, you can get pliers, wrenches, shovels, and all the other tools you need for line construction and maintenance . . . safety equipment for hot-line repairs . . . even line trucks and trailers.

By ordering through Graybar, you save the time and expense of multiple inquiries. You get products that are dependable and give long service-life — products that have been tested and accepted by linemen throughout the nation.

Your local Graybar Representative is a convenient source of information on all of the other materials required for utility pole-line projects. You'll find him well-informed on both availability and usage of the more than 100,000 electrical items distributed by Graybar.

Remember, too, that for special help on difficult problems, an experienced Graybar Outside Construction Specialist is at your service.

Graybar offices and warehouses are strategically located in over 100 cities — a feature that enables us to give you efficient local service on day-to-day orders and often saves valuable time in emergencies. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.* 176-96

You get the best of everything electrical
Via GraybaR

IN OVER 100
PRINCIPAL CITIES

SCS SUBSTATION DESIGN

Simplifies Testing and Inspection!

POTENTIAL TRANSFORMERS AND CONTROL POWER TRANSFORMERS ARE ACCESSIBLE . . . DRAWOUT MOUNTED IN ALLIS-CHALMERS SCS SINGLE CIRCUIT UNIT SUBSTATIONS

AUXILIARY TRANSFORMERS are switchgear components. That's why they are drawout mounted in safe, metal enclosed compartments of the switchgear! They are easy to get at in SCS Single Circuit Unit Substations . . . not fixed mounted or sealed into the oil filled power transformer tank.

When specifying a single circuit unit substation for your distribution system, why accept less than the accessibility, safety and low cost maintenance possible with this arrangement?

This is how Allis-Chalmers drawout mounted potential and control power transformers simplify testing and inspection . . . cut maintenance costs . . . help give better customer service:

1. Potential transformers and control power transformers are physically separated from the power transformer. This isolation is an added assurance of service continuity.

2. Easy accessibility permits use of fuses in both primary and secondary circuits for more complete equipment protection.

3. Use of standard design makes replacement easy.

4. Personnel protection. Drawout mounted auxiliary transformers are "dead" when in position for inspection, testing or maintenance.

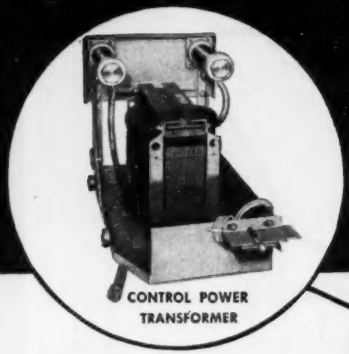
Allis-Chalmers SCS Single Circuit Unit Substations are modern appearing — can be fitted quickly into your distribution system.

A-3268

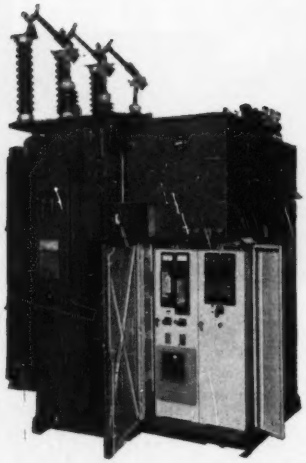
Pioneers in Load Ratio Control
Originators of 5/8% Step Regulators

ALLIS-

POTENTIAL TRANSFORMER



CONTROL POWER TRANSFORMER



What does this arrangement of Auxiliary Transformers mean to You?

1. *Easier Maintenance* because auxiliary transformers are located in the switchgear . . . not in the power transformer tank.

2. *Simplified Testing and Inspection* because the PT's and CPT's are very accessible on drawout mountings.

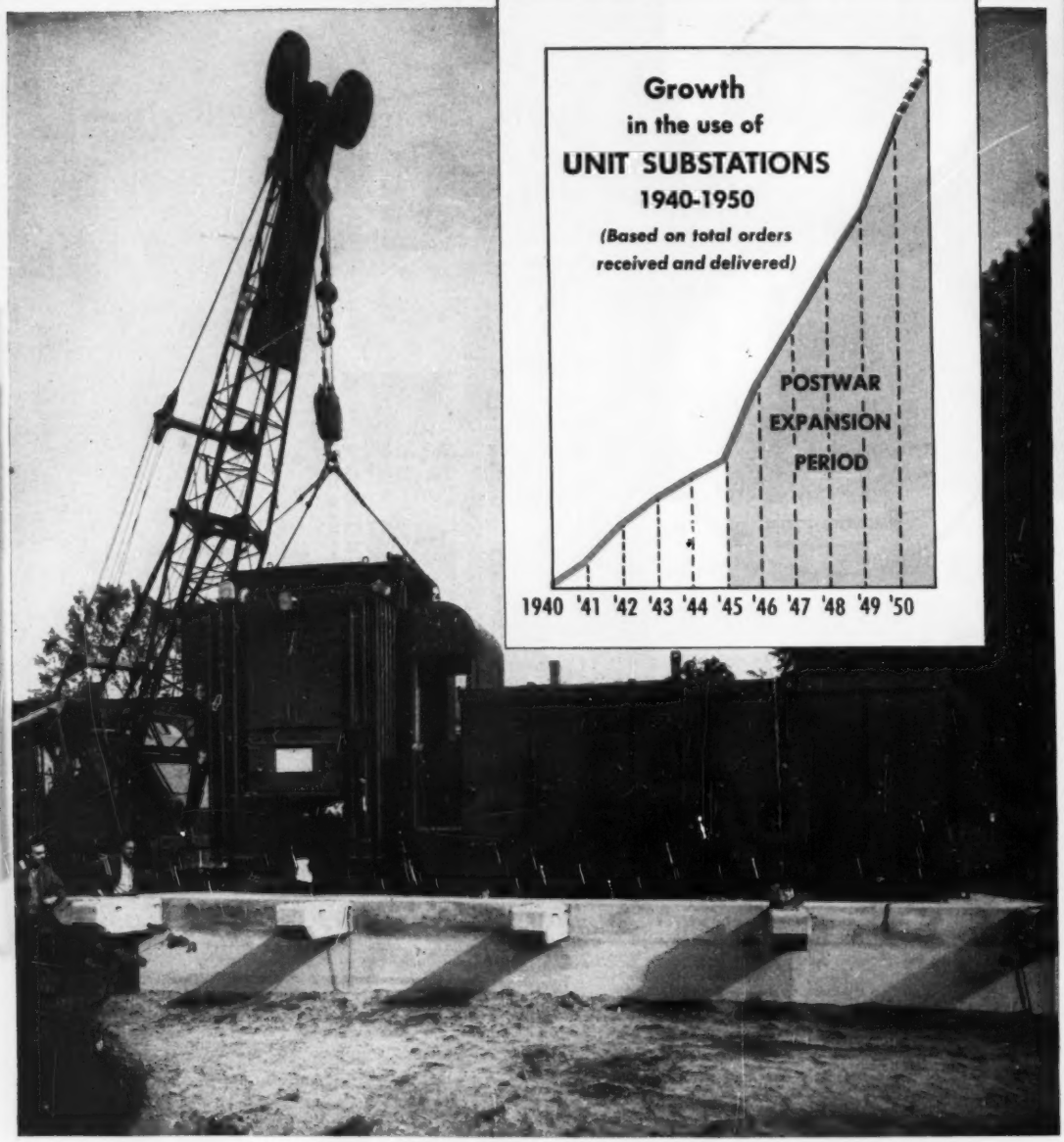
3. *Greater Safety* because they are disconnected from the line *automatically* when accessible for maintenance.

For more information, call your A-C Sales Office or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 11B7457.

CHALMERS

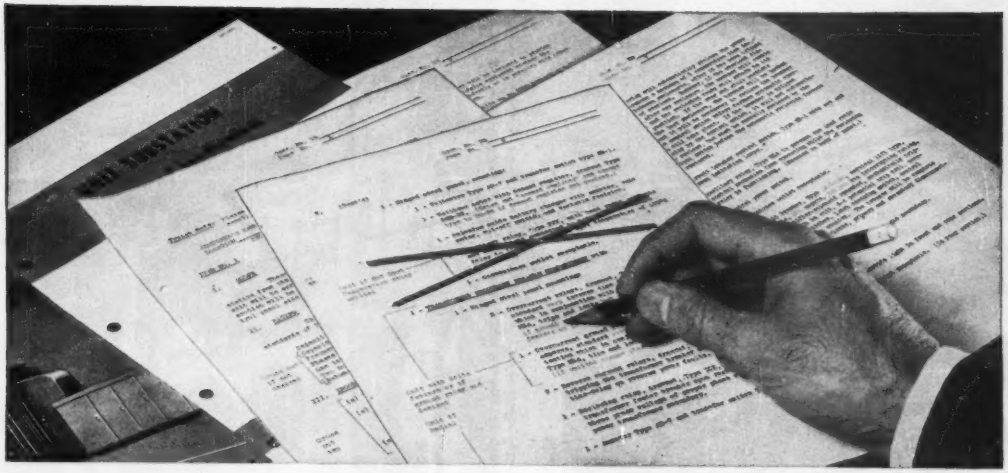
A-C ALLIS-CHALMERS

Unit Substations—Key to



QUICK INSTALLATION: G-E unit substations come to you complete—ready for operation. You merely build the foundations, position the equipment and connect to your incoming and outgoing lines. Photo shows G-E unit substation being installed on the system of the Western Massachusetts Electric Co.

Fast, Low-cost Expansion



Simplified purchasing, ease of installation help in meeting fast-growing loads . . .

The rapid trend to factory-assembled unit substations—as shown in the chart at the left—seems sure to accelerate even more tomorrow.

Faced with the fastest-growing loads in history, utilities are finding these standardized, easy-to-install units one of their most valued tools in meeting expanding power demands quickly and at lowest cost.

Because of their great flexibility, compactness and adaptability, G-E unit substations are applicable to a wide variety of system arrangements. Standard, co-ordinated designs simplify planning and purchasing.

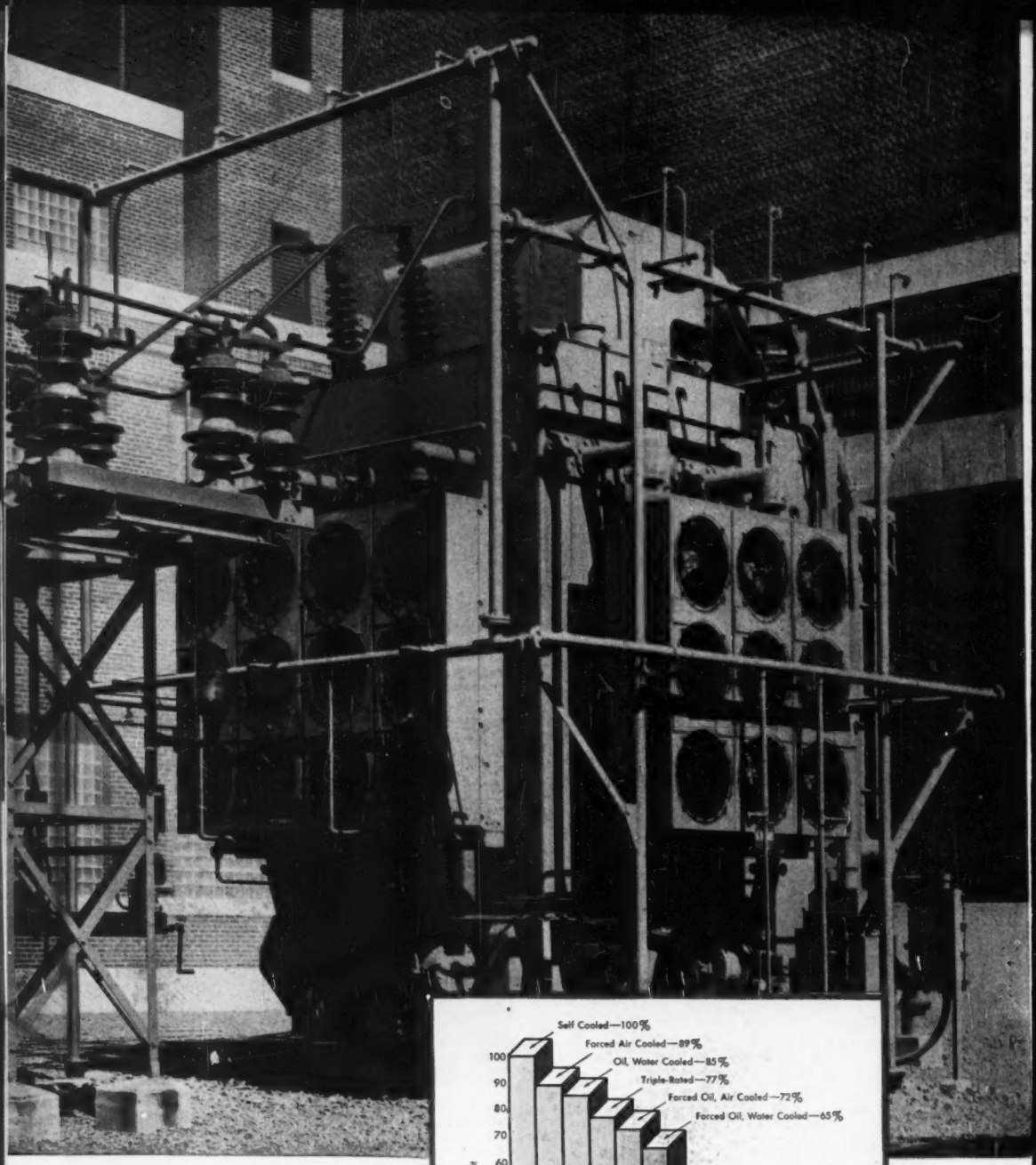
There's less worry about manpower and material problems. And proved, factory-engineered construction assures outstanding dependability. For full information, write for Bulletins GEA-3800 and GEA-4500. *General Electric Co., Schenectady 5, N. Y.*

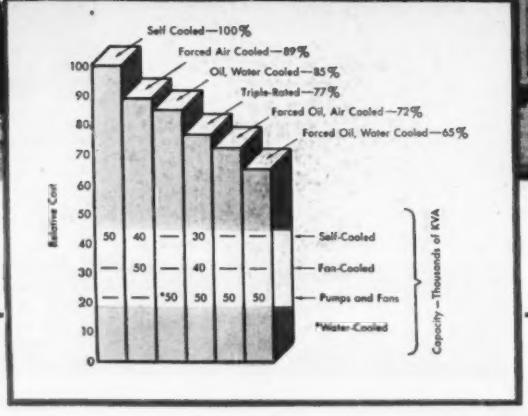
WEEKS SAVED IN ORDERING! Basic guide-form specifications for G-E unit substations are available to you, and using these, you merely add ratings and number of circuits required and cross out details not applicable. Weeks are saved in detailing layouts and piecemeal ordering. Your engineers have more time for other system work.

INSTALLED RIGHT AT LOAD: Compact, modern, attractive design of G-E unit substation enables it to be installed close to the load, even in many residential areas. Vital copper for secondary circuits is saved. The substation above was installed by the Western Massachusetts Electric Co. Note church in background.

321-74

GENERAL ELECTRIC





Cost and performance comparison of 50,000 kva, 115 kv, three-phase transformers for different methods of cooling.

ADVANCED COOLING TECHNIQUES

Cut Capital Investment 15% to 35%

Three-phase power transformers provide substantial savings over single-phase banks. That's well recognized. In many instances, the savings run as high as 28%.

But modern cooling, applied to three-phase transformers can bring even greater savings.

Consider the cost of a three-phase, self-cooled transformer as a 100% base. Then a modern external water cooler (OW) permits a reduction of 15%. The use of forced-oil, forced-air cooling (FOA) can bring a cut of 28%. And, for some applications, a combination of forced-oil cooling *and* external water cooling (FOW) can effect a total savings of 35%.

Thus, through application of advanced cooling techniques alone, substantial cuts can be made in the cost of three-phase transformers... savings that can be brought to 50% and more, as compared to the cost of single-phase transformer banks.

WESTINGHOUSE POWER TRANSFORMERS are smaller and lighter per kva than any other transformer on the market. As a result, you can expect these additional savings:

1. **Reduced space required.**
2. **Smaller foundations.**
3. **Smaller superstructures.**
4. **Lower field-assembly expense... transformers shipped more completely assembled.**
5. **Lower maintenance expense... rugged, all-welded construction plus smaller size.**

Yet all this is merely a portion of the savings possible with Westinghouse Transformers. Our representatives will be glad to discuss additional features that mean big savings to you. Phone today, or write: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Penna.

J-70579

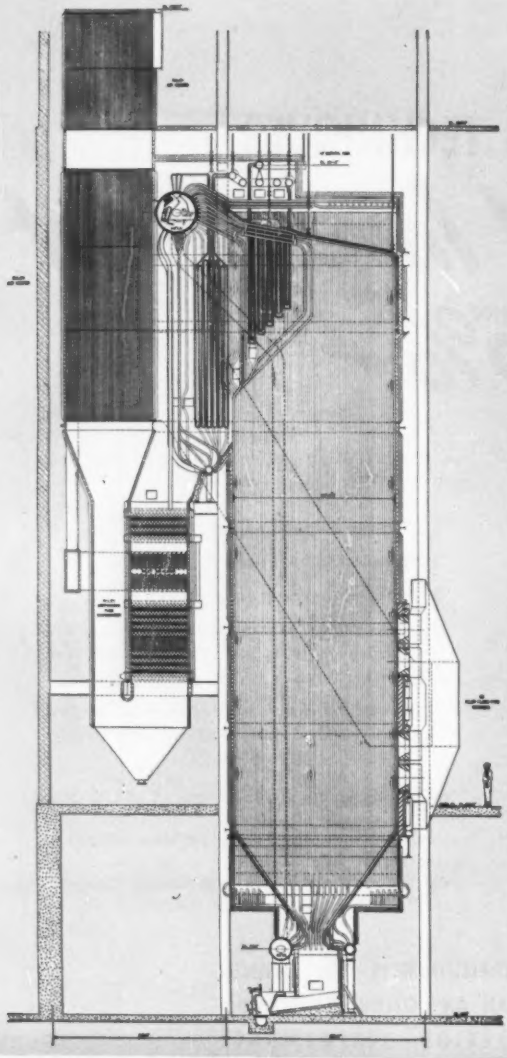
WESTINGHOUSE POWER TRANSFORMERS ARE SMALLER AND LIGHTER PER KVA THAN ANY OTHER TRANSFORMER YET THEY GIVE SUPERIOR PERFORMANCE

YOU CAN BE SURE.. IF IT'S

Westinghouse

POWER TRANSFORMERS

This is the fifth Riley Unit



Central Illinois Light Company

R. S. WALLACE STATION
E. Peoria, Illinois
Commonwealth Services Inc., Engineers

Capacity	600,000 lbs./hr.
Design Pressure	950 psig.
Steam Temperature	900°F.
Exit Gas Temperature	325°F.
Air Temperature	645°F.
Efficiency	86.5%
Pulverized Coal and Gas Fired	
Coal	
Central Illinois Strip Mine	
Moisture	20%
Volatile	31.2%
Fixed Carbon	34.4%
Ash	14.4%
B.T.U.	9000
Fusion Temperature	1900-2000°F.
Sulphur	3.2%
Heat Balance	
Dry Gas Loss	5.02%
Hydrogen and Moisture Loss	6.16%
Moisture in Air Loss	0.12%
Unburned Combustible Loss	0.40%
Radiation Loss	0.30%
Manufacturer's Leeway	1.50%
Total Losses	13.50%
Efficiency of Unit	86.5%

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Pittsburgh Cleveland Detroit Chicago
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Salt Lake City Los Angeles Portland Seattle

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

for the R.S. Wallace Station

Central Illinois Light Company ordered their first Riley Steam Generating Unit in November 1936—a second unit in July 1939—two additional units in July 1945 and the latest unit, which is now being installed, a 600,000 lbs./hr. Riley unit, in November 1948. Making a total capacity of Riley units in the R. S. Wallace Station of 1,800,000 lbs./hr. All steam generating units purchased since 1936 for this station have been Riley units.

This is a typical case. Users of Riley equipment almost invariably order additional Riley units when expanding their facilities. Following is a partial list of public utility companies who have repeatedly ordered Riley units:

Public Service Company of Indiana	7 units
Iowa-Illinois Gas & Electric Co.	6 units
Interstate Power Company	7 units
South Carolina Gas & Electric Co.	3 units
Central Ohio Light & Power Co.	5 units
Houston Lighting & Power Co.	9 units
Gulf Power Company	3 units
Utah Power & Light Co.	4 units
Otter Tail Power Co.	7 units
Mississippi Power Co.	3 units

Users come back for more Riley units not only because of the reliability, economical operation and continuity of operation of Riley equipment, but also because of the manner in which Riley handles details during the various stages of the contract—engineering, production and erection—and because of the service co-operatively rendered after years of operation. Users have learned they can rely on Riley and that it pays to investigate Riley equipment before purchasing steam generating or fuel burning equipment. It will pay you to do so.

All of these public utilities have ordered Riley Steam Generating Equipment:

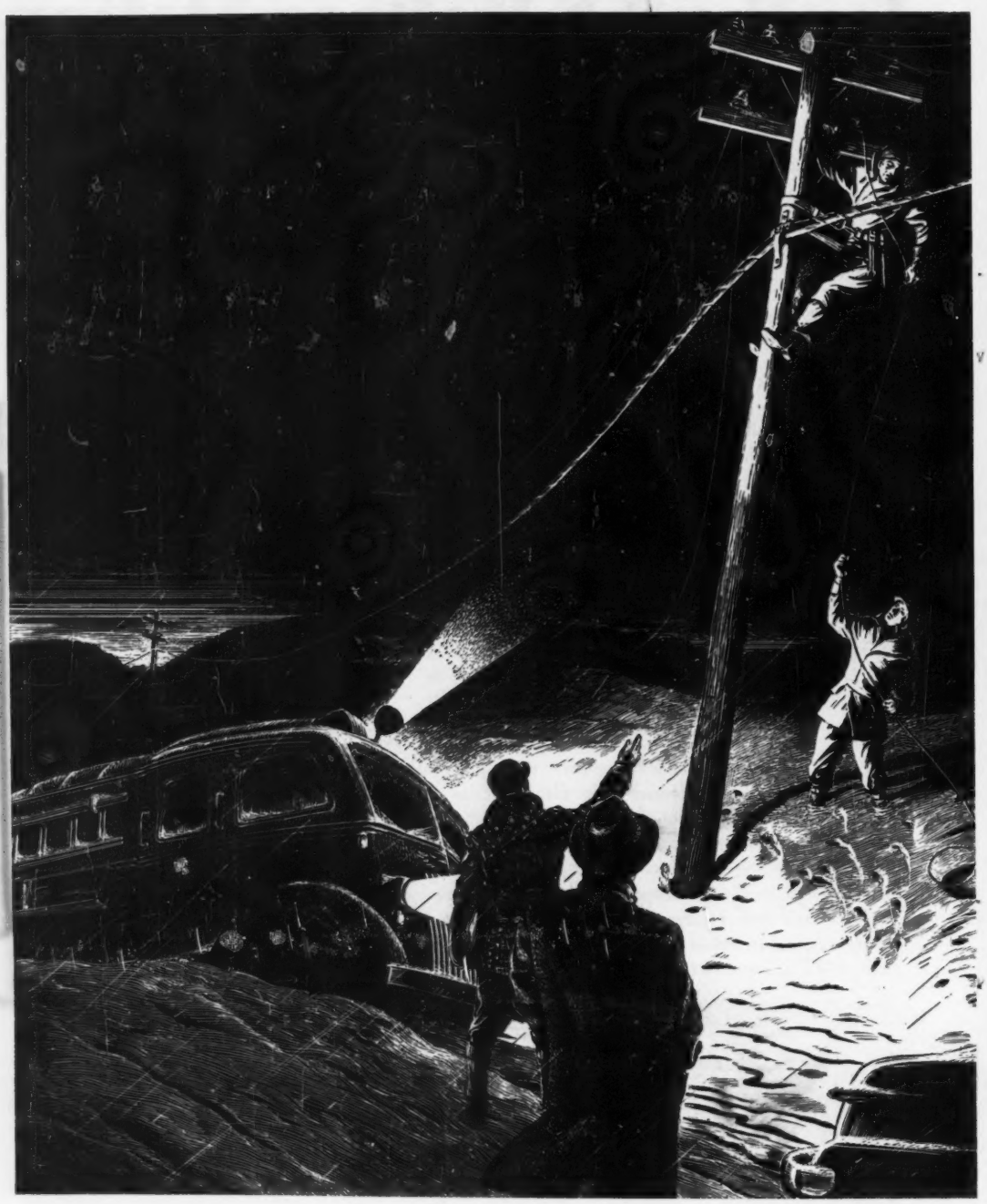
The Potomac Edison Co.	
Albright Station	1–700,000 lbs./hr.
Iowa Electric Light & Power Co.	
Boone Station	1–275,000 lbs./hr.
Northern States Power Co.	
Granite Falls Station	1–385,000 lbs./hr.
South Carolina Public Service Authority	
Moncks Corners Station	2–460,000 lbs./hr.
Monongahela Power Company	
Albright Station	1–700,000 lbs./hr.
Superior Water, Light & Power Co.	
Superior Station	1–125,000 lbs./hr.
Houston Lighting & Power Co.	
Gable Street Station	1–140,000 lbs./hr.
Gable Street Station	1–250,000 lbs./hr.
Gable Street Station	1–350,000 lbs./hr.
Greens Bayou Station	2–675,000 lbs./hr.
West Junction Station	2–400,000 lbs./hr.
West Junction Station	2–825,000 lbs./hr.
Public Service Co. of Indiana	
Dresser Station	1–300,000 lbs./hr.
Edwardsport Station	3–400,000 lbs./hr.
Noblesville Station	3–300,000 lbs./hr.
Northern Virginia Power Co.	
Riverton Station	1–350,000 lbs./hr.
Central Illinois Light Co.	
R. S. Wallace Station	1–600,000 lbs./hr.
R. S. Wallace Station	4–300,000 lbs./hr.
Arkansas Power & Light Co.	
Cecil Lynch Station	1–650,000 lbs./hr.
Utah Power & Light Co.	
Orem Station	1–450,000 lbs./hr.
Jordan Station	1–620,000 lbs./hr.
Jordan Station	1–575,000 lbs./hr.
Worcester County Electric Co.	
Webster Street Station	1–325,000 lbs./hr.
West Penn Power Co.	
Milesburg Station	2–210,000 lbs./hr.
Interstate Power Co.	
Dubuque Station	1–200,000 lbs./hr.
Lansing Station	2–120,000 lbs./hr.
Fox Lake Station	2–120,000 lbs./hr.
Clinton Station	1– 45,000 lbs./hr.
New Orleans Public Service Co.	
Market Street Station	1–330,000 lbs./hr.
Iowa-Illinois Gas & Electric Co.	
Riverside Station	3–250,000 lbs./hr.
Coralville Station	1– 60,000 lbs./hr.
Moline Station	2–200,000 lbs./hr.
City of Los Angeles	
Harbor Steam Station	3–825,000 lbs./hr.
Harbor Steam Station	2–675,000 lbs./hr.
Mississippi Power Co.	
Plant Eaton	3–230,000 lbs./hr.
Otter Tail Power Co.	
Kidder Station	2–100,000 lbs./hr.
Crookston Station	2– 75,000 lbs./hr.
Devils Lake Station	1– 75,000 lbs./hr.
Canby Station	1– 75,000 lbs./hr.
Ohio Edison Co.	
Mad River Station	1–250,000 lbs./hr.
South Carolina Power Co.	
Plant Hagood	2–230,000 lbs./hr.
Plant Hagood	1–900,000 lbs./hr.
Gulf Power Co.	
Pensacola Station	2–230,000 lbs./hr.
Pensacola Station	1–325,000 lbs./hr.
Union Electric Co. of Missouri	
Ashley Street Station	2–285,000 lbs./hr.
Ashley Street Station	3–310,000 lbs./hr.
Central Ohio Light & Power Co.	
Woodcock Station	2–120,000 lbs./hr.
Woodcock Station	1– 90,000 lbs./hr.
Woodcock Station	2– 60,000 lbs./hr.
Pennsylvania Electric Co.	
Williamsburg Station	1–300,000 lbs./hr.
Carolina Power & Light Co.	
Moncure Station	2–330,000 lbs./hr.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

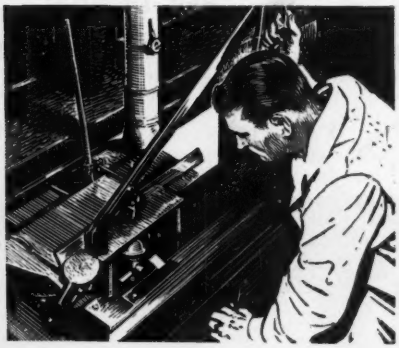
ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS



IN THE FIELD from the Great Lakes to the Gulf, General Electric keeps careful watch over the effects of weather on all types of cable. G-E engineers know what weather can do to distribution —know how to fight it with practical cable design.

WIRE AND CABLE FOR ELECTRIC UTILITIES

We know what Rough weather means



LABORATORY TESTING

IN THE LABORATORY at General Electric, technicians put General Electric insulating materials through the most brutal weather and temperature conditions—rigid mechanical and electrical tests. Materials have to measure up before they go into the field.

INSULATION RESEARCH
DESIGN ENGINEERING
CONTROLLED MANUFACTURING
FIELD SERVICE
INTEGRATED EXPERIENCE

When weather goes on a rampage it's more than just a weather report to G-E cable engineers. They've studied weather's effects on cable from coast to coast—they know what it will do in your locality—and they've designed cable that will stand up to your weather conditions at their roughest.

G-E pre-assembled aerial cable, for instance, was developed when G-E engineers decided to fight the yearly attacks of ice, wind, and sleet. As a result of G-E materials testing—and all other phases of G-E engineering and manufacturing—you can now put up pole lines that are built for rough weather. With G-E pre-assembled cable, you've got a supporting messenger that will withstand the severe ice and wind loadings encountered in winter storms—and you get installation speed that can't be matched.

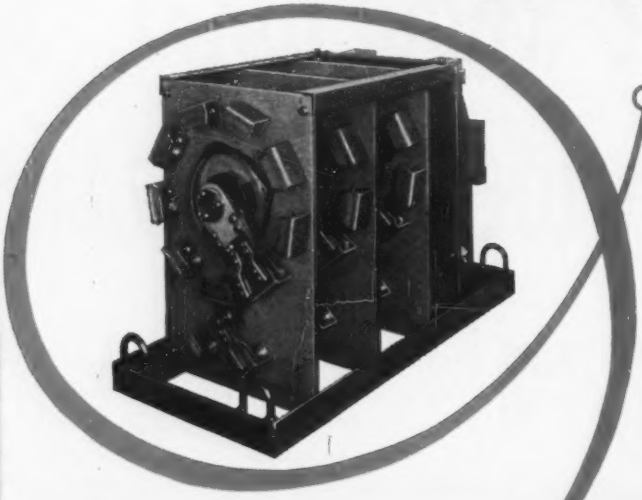
When cable problems arise, don't hesitate to call in your G-E cable specialist. By putting the G-E staff to work, he may be able to save you countless hours of research and design. Section W57-727, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

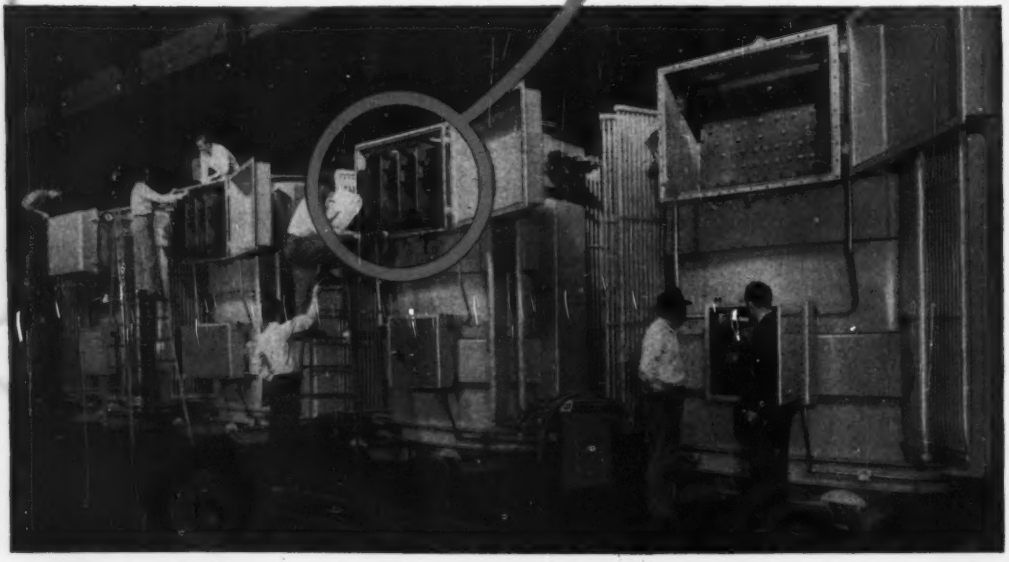
GENERAL ELECTRIC

PENNSYLVANIA TRANSFORMER COMPANY

Introduces



for Pennsylvania Load Ratio Control Transformers, Step Voltage Regulators, and Integral Unit Substations.



Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PENNSYLVANIA • *Greater Pittsburgh District*

*PENNSYLITE

An outstanding, new, low power factor, low loss dielectric material, developed expressly for Pennsylvania Underload Tap Changers.

WHAT IS PENNSYLITE

Pennsylite is a low power factor, low dielectric loss, laminated material developed expressly for the panels in the switch assemblies of Pennsylvania's 16 and 32 step Underload Tap Changing Equipment.

WHY WAS PENNSYLITE DEVELOPED

It is no secret that difficulty has been experienced with existing fabric base and paper base laminates. Most of this difficulty has been traced to entrapped gas sealed within the cured laminated structures. These gas voids increased the power factor and dielectric loss of the laminates and resulted in laminates having erratic voltage strength. Under electrical stress, voltage found its way through the void structures parallel to the laminations destroying the insulating value of the laminates.

PENNSYLITE ELIMINATES THIS PROBLEM

Pennsylite combines the best electrical properties of low loss paper-base laminates and the best mechanical properties of fabric-base laminates.

A specially treated, fine weave fabric and low loss thermal setting resin binder make Pennsylite a homogeneous laminated structure free of gas voids.

NO VISIBLE DIELECTRIC FATIGUE

A 60 cycle, 90 KV voltage was applied continuously to Pennsylite step voltage regulator panels for a period of several days. No disturbances or failures resulted. Radio Influence Voltage Tests indicated exceedingly low microvolt levels, showing that ionization leading to corona was not evident.

WHAT ARE THE OUTSTANDING QUALITIES OF PENNSYLITE

1. Low 60 cycle power factor (1.5 to 4% at 20°C.) when received from supplier.
2. Ability to withstand test voltages continuously applied parallel to laminations for an extended period of time.
3. Will not delaminate or split parallel to laminations when exposed to 120°C. continuously.
4. High impact strength perpendicular and parallel to the laminations.
5. High flexural, tensile, and bond strength.

WHAT MAKES THIS NEW DEVELOPMENT OUTSTANDING

Mechanically, existing paper-base laminates are weaker than existing fabric-base laminates. But, as a rule, the electrical properties are poorer for fabric-base laminates than for paper-base laminates. In Pennsylite the best electrical properties of low loss, resin bound paper-base laminates are combined with the best mechanical properties of fabric-base laminates.

*Trademark

TO ASSURE UNIFORM DIELECTRIC QUALITY, *specifications for evaluating Pennsylite have been adopted by Pennsylvania Transformer Company and accepted by the suppliers as a standard prodedure for evaluating this new laminate.*

PROCEDURE FOR EVALUATING PENNSYLITE

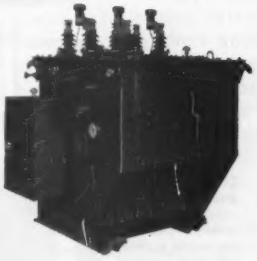
1. Measure power factor at 60 cycles, 20°C.
2. Heat in dry oven for 36 hours at 250°F. (121°C.) to check for possible blistering or delaminating.
3. Measure power factor at 60 cycles. Compare with (1). Power factor must be within prescribed tolerances.
4. Mount 2 studs (½" Dia) 3½" apart on a section of Pennsylite, and immerse in transformer oil 78°to 82°C. for one hour.
5. Evaluate parallel to lamination voltage strength by applying 60 cycle voltage and obtaining audible and visual corona points, withstand KV and breakdown KV.
6. Check dielectric fatigue. Apply test voltages continuously for several days duration.

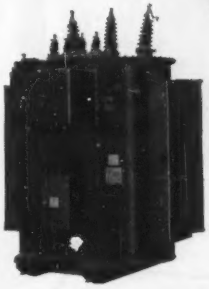
NOTE: *Each piece of Pennsylite is given a 60 cycle voltage power factor test before it is fabricated for use into a Pennsylvania Underload Tap Changer.*

YOU'LL FIND PENNSYLITE AND MANY OTHER DESIRABLE FEATURES IN PENNSYLVANIA

Step Voltage Regulators

156 Kva Step Voltage Regulator. 12000 Volts. 32-⅝% taps. Total tap range plus or minus 10%.





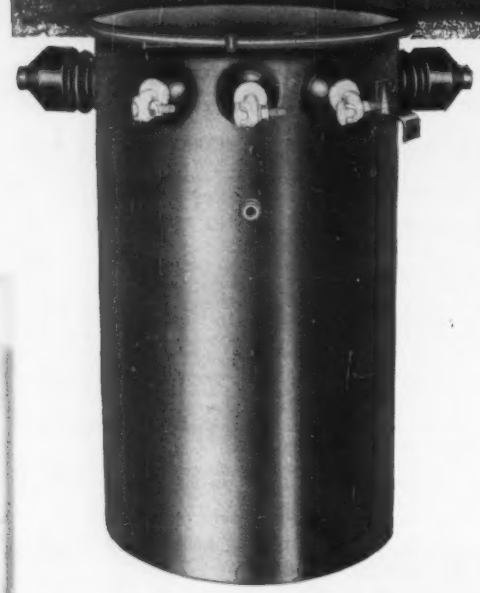
Load Ratio Control Transformers

2500 Kva, 3 Phase, 66000-2500/4330Y x 7500/-12990Y Volts. Low Voltage winding equipped with 16-15/16% taps for automatic tap changing under load.

Integral Unit Substations

1500 Kva Single Circuit Unit Substation. High Voltage: 22000 Volts. Low Voltage: 4160 Volts. 32-⅝% taps on Low Voltage winding.

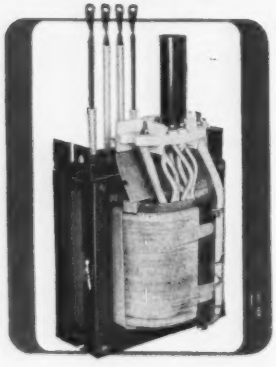
WAGNER Form W TRANSFORMERS



New Shur-Seal cover prevents oil contamination

Wagner Form W Transformers are now provided with the exclusive Wagner SHUR-SEAL Cover . . . a *positive* seal that completely prevents oil contamination caused by injurious "breathing" of atmospheric air, moisture and dust particles during the daily load cycle.

The SHUR-SEAL Clamping ring maintains uniform pressure *around the entire periphery of the cover* to assure sealed-tank construction, airtight as a welded tank, but permits removal of cover, if necessary, by loosening a *single* stainless steel bolt.



The Form W core is made of cold rolled oriented grain transformer steel, carefully heat treated to obtain the lowest practical magnetic losses. The preformed core is assembled in a shape that provides a path for the magnetic flux parallel to the grain of the steel.

Form W

Means small size, light weight, excellent performance

Wagner Form W Transformers are exactly right for modern distribution systems. They are liberally designed—yet small in size and light in weight to permit greater ease of handling, storing, and mounting on poles.

Electrical performance is excellent—core and copper losses are relatively low . . . regulation at both 100% and 80% PF is good . . . exciting current is extremely low . . . short time overload capacity is high. Form W gives the type of service that you need.

Investigate Wagner Form W Transformers today.

Wagner Electric Corporation 1891 WE 1951

T314

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS · TRANSFORMERS · INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

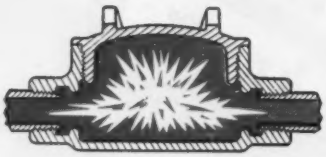
Approved by UNDERWRITERS LABORATORIES
The men who USE them know the difference!
They like this—
BETTER DESIGN
If you have ever spliced wires and cables in real mean locations, you probably are a strong "booster" for Penn-Union Connectors - - -
Because you know how much easier they are to use in close quarters: Working up against a wall...squeezing into small boxes, to join short ends of stiff wire . . . reaching around pipes, and splicing wires in dark holes where you can hardly see.
LARGER SURFACES
for the wrenches make the Penn-Union connector more practical—you grip it from ANY angle, with ANY kind of wrench (box, socket or open-end). Developed by 20 years of constant improvement. Accurately made, with rigid engineering inspection. Reusable over and over. Can be furnished in Bronze or Aluminum.
Far More in use than any other
Sold by Leading Wholesalers
PENN-UNION ELECTRIC CORP.
ERIE, PA.
Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto
The Complete Line of Conductor Fittings
PENN-UNION

Explosion-Proof CONDULETS*

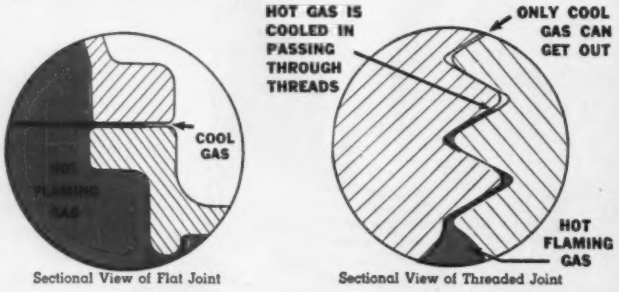
give you PROTECTION where flammable atmospheres are present or likely to be present

. . . because every explosion-proof CONDULET . . .

1 Withstands the force of an internal explosion

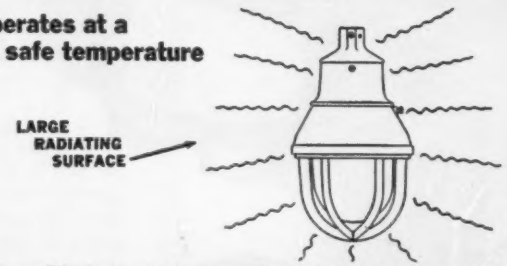


2 Has flametight joints



Sectional View of Flat Joint — Sectional View of Threaded Joint

3 Operates at a safe temperature



All Crouse-Hinds explosion-proof electrical equipment is built to exceed Underwriters' Laboratories requirements.

Thousands of explosion-proof and dust-tight CONDULETS are listed in Crouse-Hinds CONDULET Catalog.

A Nationwide Distribution Through Electrical Wholesalers

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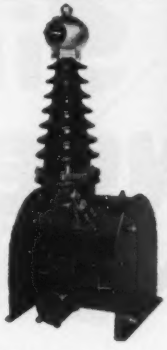
ALLIS-CHALMERS
INSTRUMENT TRANSFORMERS

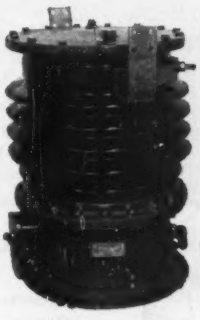
Profit 3 Ways with 400 RATINGS

1. The type KO instrument transformer combines versatility in mounting with accuracy on heavy duty metering or relaying applications. It mounts in any position, horizontally or vertically, on poles or platforms. Tank is of all-welded construction. Transformer is vacuum-pressure compound filled to eliminate voids. Ratings: up to 15 kv — 10 to 800 amperes.



2. The newly designed type SPW potential transformer will handle accurate metering or relaying service even with the heavy operating burdens of sectionalizing switching requirements. Strength is exceptionally high. Tank is hermetically sealed. New design is very compact . . . solves the space limitation problem. Ratings: 24, 34.5, 46 and 69 kv voltage class.

3. Because the type PWD potential transformer is compound filled and the case completely welded and hermetically sealed, there is no changing or testing of liquids necessary. Transformer is free from breathing. Proper construction and design achieve high dielectric strength and high accuracy performance on all standard secondary burdens. Ratings: 240 to 14,400 primary voltage.



4. The porcelain clad type CJ outdoor oil-filled current transformer is of the wound type. It is designed for precise metering and has liberal current capacity with windings of high mechanical strength. Primary leads are brought out to blade type terminals through the porcelain bushing. Manufactured in all standard current ratings for operation on line voltages of 25 kv through 69 kv.

with 400 RATINGS

AMONG THE MORE than 400 ratings of Allis-Chalmers instrument transformers, there's one that will fit your design needs. That's why you can save time and money, too, by standardizing on A-C instrument transformers. In every type you'll find the right combination of the best in engineering and materials. Whether your need is for instrument transformers or metering outfits you will profit three ways when you call on the Allis-Chalmers source of supply. You get (1) top quality, (2) prompt shipment and (3) wide selection.

Allis-Chalmers
Milwaukee 1, Wis.

Please send new 32 page bulletin 6187168 listing types, ratings, applications and prices of Allis-Chalmers instrument transformers.

Name .....

Title .....

Firm .....

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A-3448

ALLIS-CHALMERS

PIONEERS IN POWER AND ELECTRICAL EQUIPMENT FROM GENERATION THROUGH UTILIZATION

How to Simplify YOUR INVENTORY of POLE LINE HARDWARE

The industry's ONE and ONLY guide toward simplification of Pole Line Hardware Stocks. If you don't have a copy, write today. Locke Department, General Electric Company, Baltimore, Maryland.

To simplify and reduce the kind and number of Pole Line Hardware items you carry in Inventory is a guaranteed way of helping yourself lick rising costs and material shortages.

A FEW OF THE MANY BENEFITS

You reduce over-all dollar value of inventory. You practically eliminate costly. slow-moving items. You sharply reduce storage requirements. Stores accounting and auditing are simplified.

SIMPLIFICATION MADE EASY WITH LOCKE'S RM* HANDYLOG

It's the perfect tool for men working toward simplification and standardization of Pole Line Hardware stocks. Lists ALL the standard hardware items you need. Each item is a fast mover. RM* items are regularly in production, and they're carried in stock by your Locke Regional and Distributors' Warehouse. You're therefore certain of better delivery than you are when you order specials.

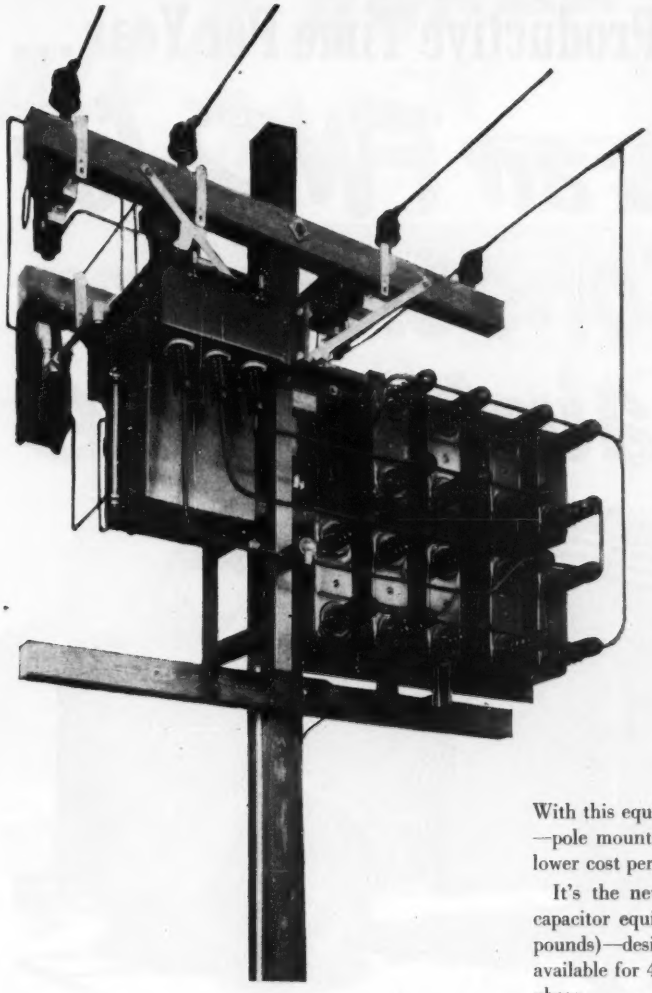
LOCKE RM* HANDYLOG ONLY GUIDE OF ITS KIND

Concentrate your planning and purchases on Locke RM* hardware items. You'll be taking the industry's only practical short cut toward fully realizing the big money-saving, time-saving benefits of simplification of Pole Line Hardware stocks. Locke Department, General Electric Company, Baltimore, Maryland.

*RM (Repetitive Manufacture)
A program designed to help reduce the installed cost per kilowatt on line and station equipment.

LOCKE

Before you buy stop! See what Locke's Got!



New

G-E switched capacitors for pole mounting

- **LOW COST**
- **LIGHT WEIGHT**
- **FACTORY ASSEMBLED**

The new pole-mounted equipment consists of nine 25-kvar capacitors in a steel rack equipped with cross-arm hangers; a solenoid-operated oil switch; a potential transformer; and an automatic control. The entire equipment is factory-wired and assembled—shipped as a unit, and ready for mounting when received.
Single-step automatic control, either voltage or current, is available in a separate outdoor housing for base of pole mounting where it can be easily inspected and serviced from the ground.

With this equipment you can get switched capacitors—pole mounted—for your distribution circuits—at a lower cost per kvar than ever before.

It's the new G-E open-type 225-kvar auto-switch capacitor equipment. Compact, lightweight (only 950 pounds)—designed specifically for pole mounting, it is available for 4160-, 4800- and 7200-volt circuits, three-phase.

Automatic controls are in a separate housing for mounting at the base of the pole. Inspection and servicing are easy.

Installation costs are low—the equipment is shipped completely wired and assembled. Simply mount the equipment on the pole and connect the controls.

Your nearest G-E Apparatus Sales office has full information. *Apparatus Dept., General Electric Company, Schenectady 5, New York.*

407-28

GENERAL ELECTRIC

Choose More Productive Time Per Year . . .

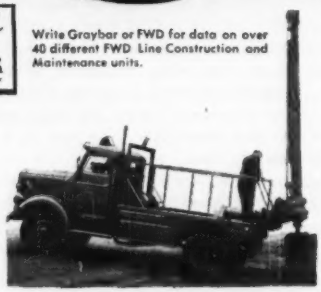
Choose an FWD for Line Construction and Maintenance

GraybaR Distributed by GraybaR ELECTRIC COMPANY

Write Graybar or FWD for data on over 40 different FWD Line Construction and Maintenance units.

"Us linemen sure like an FWD. It gets us where we want to go with no 'crowding' . . . takes the tools we need with us and always has 'em handy. With an FWD —we're sure of getting there — and getting back."

"When my crews go out for line construction or maintenance—they pick the FWD to go with 'em every time. Seems it helps get more work done easier—in less time —and they go on and off the road with greater safety."



WHEN you choose an FWD — you choose more than a truck — you get a specially engineered utility service unit—completely equipped for the job. That means you'll get more jobs done in less time—easily meet routine schedules—restore service in emergency faster. Ask for the whole FWD story—about FWD utility-engineered models — four and six wheel drives. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory — Kitchener, Ontario. *World Wide Sales and Service.*

America's Foremost Heavy-Duty Truck

ALL 4 AGREE on NEW APPLETON V-51 SERIES

CONVERTIBLE VAPORTIGHT LIGHTING FIXTURES

Malleable Iron Fixture Body ½" or ¾" Hubs.
Neoprene Rubber Ring Attachment
One of Four Reflector Styles Baked Porcelain Enamel Finish
Patent Applied For
Exclusive Unit Assembly (Receptacle—Globe—Guard)
APPLETON
APPLETON

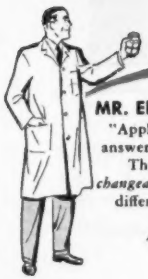
WITH MALLEABLE IRON BODIES

100 WATT OR 150-200 WATT UNITS

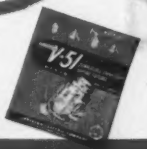
MR. PLANT ELECTRICIAN Says: "This V-51 Fixture is a real work-saver! Re-lamping's a cinch. One trip up the ladder to exchange Unit Assemblies and the job's done! Cleans fast, too. I attach or remove reflectors with a twist of the wrist—thanks to V-51's neoprene rubber ring attachment."

MR. PLANT OWNER Says: "Nothing beats this fixture for economical service and maintenance! My men can service it safely and quickly—*without tools!* Converts just as easily to high or low wattages. We're saving on lamps, too. V-51's shock-absorbing socket lets us use standard lamps instead of more expensive mill-type bulbs."

MR. ELECTRICAL CONTRACTOR Says: "These V-51 fixtures are tops when it comes to quick and easy wiring. The line's complete, too—gives me a pendant, ceiling or bracket type mounting for every kind of installation. Best of all, these fixtures are efficient and dependable. I know my customers are going to be satisfied with them."



MR. ELECTRICAL WHOLESALER Says: "Appleton V-51 Series Vaportight Fixtures answer my stock-keeping problems perfectly. The line's variety—*plus complete interchangeability of parts*—means I can meet 256 different fixture requirements with only a small investment in inventory!"



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APPLETON ELECTRIC COMPANY

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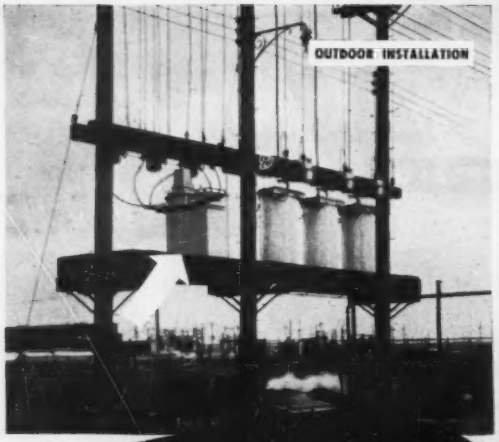
MALLEABLE IRON CONDUIT FITTINGS

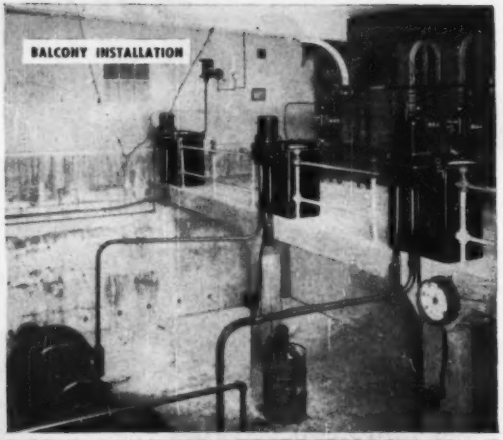
APPLETON ELECTRIC PRODUCTS

OUTLET BOXES AND SWITCH BOXES

INDUSTRIAL LIGHTING EQUIPMENT

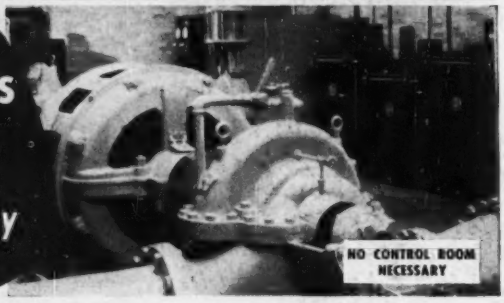
EXPLOSION-PROOF FITTINGS • KEELITES





EC&M (2300 VOLT) (Oil-Immersed) Motor Starters

Help Speed Production and Promote Safety



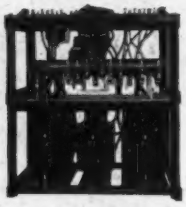
These EC&M auto-transformer Starters provide *automatic* push button operation of 2300 volt squirrel-cage and synchronous motors. They bring motors up to speed quickly, safely. Human hands could not do it so well—consistently. *Continuous torque* acceleration is maintained at all times, including the transition period from reduced voltage starting to full voltage running.

Motor circuits are made and broken under oil—thoroughly safe, no dust hazards. The simple, double-throw contactor is always well lubricated and protected from corrosion. Grounding the case makes a shockproof installation. A self-contained potential transformer provides 220 volts for the push button circuit—another feature of convenience and safety.

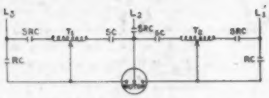
Magnetic overload relays give dual protection—inverse-time-element normal operation and instantaneous trip should a heavy over-current occur.

UP-KEEP IS LOW BECAUSE OF THEIR SIMPLE DESIGN

Complete compensator



Compensator mechanism



Continuous torque transition

Write for Bulletin 1047 and No. 19 ACCELERATOR Bulletin

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Uptegraff DRY TYPE TRANSFORMERS

Easy to Install · Economical Dependable

Uptegraff type DB Dry Type Transformer with ventilated weatherproof enclosure, for indoor or outdoor service. Sizes, 7.5 to 500 KVA.

Type F Dry Type Transformer, for protected cabinet mounting, or indoor service. Standard sizes, 0.25 to 15 KVA. Can be built in larger sizes.

Completely enclosed type E Uptegraff Transformer. Available in sizes from 0.25 to 10 KVA, for indoor service. All Uptegraff transformers are built and tested in accordance with the applicable standards of the N.E.M.A., the A.S.A., and the A.I.E.E.

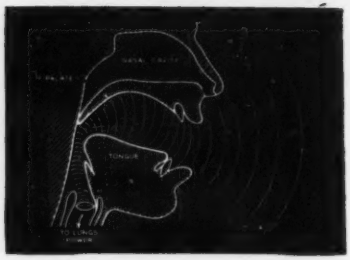
The built-in dependability and economy of Uptegraff Dry Type Transformers comes from engineering and manufacturing skill and experience. All Uptegraff Dry Type Transformers are made with durable, non-inflammable Class B insulating materials. Available in standard types and sizes from 0.25 to 2000 KVA, and in special styles to meet individual specifications when required by the application.

Some of the more popular Uptegraff "Specialty" Dry Type Transformers are illustrated here. Write for a copy of bulletin No. 126, which gives full information on all types and sizes of Uptegraff Dry Type Transformers. If you wish detailed data and prices, give capacity required and service for which the transformer is intended.

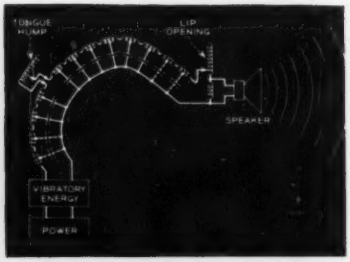
R. E. UPTEGRAFF MANUFACTURING COMPANY

SCOTTDALE, PENNSYLVANIA

Makers of POWER • DISTRIBUTION • INSTRUMENT • SPECIALTY TRANSFORMERS



It tells how you talk



The machine at the left is saying "Ah!" It's the new electrical vocal system developed at Bell Laboratories. Top sketch shows human vocal system also saying "Ah!" The electrical model is sketched below it. Energy source at bottom of "tract" can emit a buzz *sound, like vocal cord tone, or the* hiss *sound of a whisper.*

No one else speaks exactly like you. Each of us uses different tones to say the same words. To study and measure *how* we make speech, acoustic scientists of Bell Telephone Laboratories built a model of the vocal system.

Electric waves copy those of the vocal cords, electric elements simulate the vocal tract, and, by adjustments, vowels and consonants are produced at pitches imitating a man's or woman's voice.

Using this electrical system, telephone scientists will be able the better to measure the properties of people's voices. Knowing more about speech they can find better and cheaper ways to transmit it.

This is another step in the research at Bell Telephone Laboratories which pioneered the exact knowledge of speech. Past work in the field is important in today's fine telephone service. A still deeper understanding of speech is essential in planning for tomorrow.

BELL TELEPHONE LABORATORIES

Exploring and inventing, devising and perfecting, for continued improvements and economies in telephone service.

DIAGRAM TO

FROM THE LAYOUT TO THE LINE — R&IE Substation service is controlled and centralized at one source. One responsibility, under "one roof" for design, fabrication and application of Blade Switching Equipment.

R&IE Know-How — verified by thirty-seven years of dependable construction experience — produces a correct installation, mechanically and electrically.

DELIVERY

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

- CONDUCTOR SUPPORTS CLAMPS AND FITTING
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

RECORDING INSTRUMENTS
PORTABLE INSTRUMENTS
AMPERES
D-C VOLTS
30 60 90 120
Westinghouse
10 20 30 40 50 60
VOLTS
PANEL INSTRUMENTS
40 60
20 80
D-C
AMPERES
100
SWITCHBOARD INSTRUMENTS

Only a *complete line*

answers *all your* electrical measuring requirements

The case of Mastic Tile Corporation demonstrates how the complete line of Westinghouse Instruments holds answers to your electrical measurement problems.

Mastic's problem was one of predetermining load on a Banbury Mixer motor in order to facilitate the operator's job and speed the mixing cycle. It was answered by the standard Westinghouse GY-40 Recording Wattmeter with proper choice of scale, current and potential transformers, and chart speed. In fact, so well did this standard instrument accomplish its job that final results show—a 15 percent reduction in mixing cycle time along with the elimination of damaging surge shocks which can now be anticipated and prevented by the machine operator.

Westinghouse will continue to give you a wider selection for every need . . . whether it be a-c or d-c current and voltage, single or polyphase circuits, watts or vars, frequency, power factor, synchroscopes, temperature indicators, ground detectors or synchrotie. You get assurance of quality too, because every applicable instrument . . .

Meets A. S. A. Performance Requirements!

All Westinghouse Instruments are built to meet the rigid performance requirements of the American Standards Association. No more exacting guarantee of an instrument can be made. And you get . . .

Competent Application Assistance!

Westinghouse Instrument Application Engineers are available to help you in selecting and applying the proper instruments for your application. Simply call your nearest Westinghouse office.

For complete information about Westinghouse Instruments write for Booklet B-4696, address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40407

YOU CAN BE SURE... IF IT'S Westinghouse INSTRUMENTS

Now—Free
TRUCK SAVER
Inspection

First step of a complete TRUCK SAVER *plan*

- **Available to all International Truck owners**
- **No cost, no obligation for a 99-point checkup**
- **For a limited 3-month period ending September 30**

How easily you can keep your Internationals operating at peak efficiency in an uncertain future may depend on what you do within the next 90 days.

If you take advantage of our Truck Saver Inspection, you'll be taking the first step toward putting your Internationals in shape for the "come what may" days ahead.

Since this inspection doesn't cost you a penny, you have everything to gain—nothing to lose. You can save dollars now and perhaps many more before the end of 1951.

So get ready now to keep your trucks on the job despite shortages. The sooner you get your free Truck Saver Inspection, the sooner you see practical reasons why you should take advantage of our complete International Truck Saver Plan.

Look what the complete International Truck Saver Plan offers

The complete International Truck Saver Plan has been developed by experts, after a thorough study of today's truck operating problems. It offers these benefits to International Truck operators:

1. Better performance over a longer truck life: trucks are kept in shape to do the most efficient job possible until they can be replaced by new units.

2. Delays minimized in getting new parts: by anticipating future requirements, the demand for needed parts can be accurately estimated.

3. Maintenance costs cut, down time reduced: by preventing major breakdowns, a big saving is effected in both time and money.

4. Truck value maintained: trucks kept in the best possible condition are worth more when it's time for replacement.

Take advantage of the International Truck Saver Plan now

If you want to save yourself trouble and money in the months ahead, you belong in the International Truck Saver Plan.

Get your free Truck Saver Inspection—find out from your International Truck Dealer or Branch how the plan can help *you* keep your Internationals going at peak efficiency.

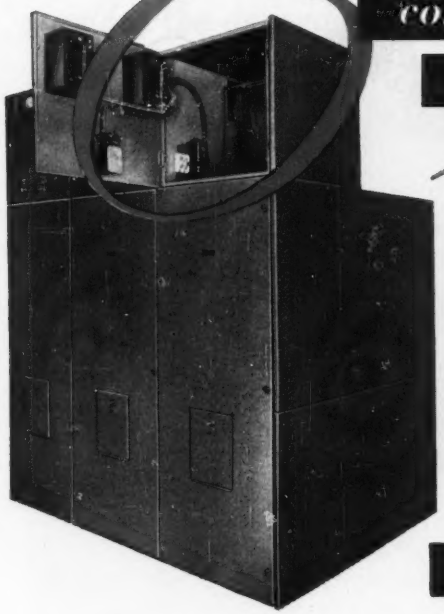
International Harvester Builds
McCormick Farm Equipment and Farmall
Tractors . . . Motor Trucks
Industrial Power . . . Refrigerators and Freezers

International Harvester Company • Chicago

INTERNATIONAL TRUCKS

Heavy-duty engineered for the long haul

one construction difference

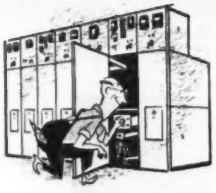


Isolation of meters and instruments in individual compartments atop the basic unit structure is one characteristic difference of I-T-E Metal-Clad Switchgear. Most applications require only one compartment located directly above the circuit breaker section. If additional relays are needed, they are placed in a second compartment above the bus section.

Top mounting of instruments saves valuable space by reducing the depth of metal-clad enclosures. Bus and control wiring can be reached easily. Instruments are out of the way of non-operating movements, protected, and readily accessible.

These advantages result from just *one* construction difference! "Top-hat" instrument mounting, like so many other superior metal-clad features, originated at I-T-E, where switchgear is a major concern, not a sideline. For further information, write I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pa. Subsidiaries: Railway and Industrial Engineering Company, Greensburg, Pa., Eastern Power Devices, Ltd., Toronto.

four operating advantages

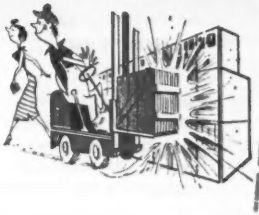


Increased Safety For Operating Personnel

Type HV Breakers are disconnected with the enclosure door shut. Operator is doubly protected from five parts by insulating air space and grounded metal front panel of the interphase barrier.

Reduced Breakage

Location of instruments and relays at top of board keeps them out of harm's way. They are readily accessible but cannot be accidentally damaged by passing people or equipment.

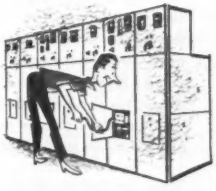


Accurate Operation

Instruments and relays, because of their location, are not affected by careless opening and closing of the panel door. Accidental tripping of relays and false readings of instruments are eliminated.

Reduced Testing Time

Because instruments and relays are placed in an isolated compartment at the top of the board, I-T-E's famous "fast-test" feature is possible. Secondary circuits can be tested without opening the front door.



The I-T-E Company

BURNDY-BUILT *to do an important job* BETTER

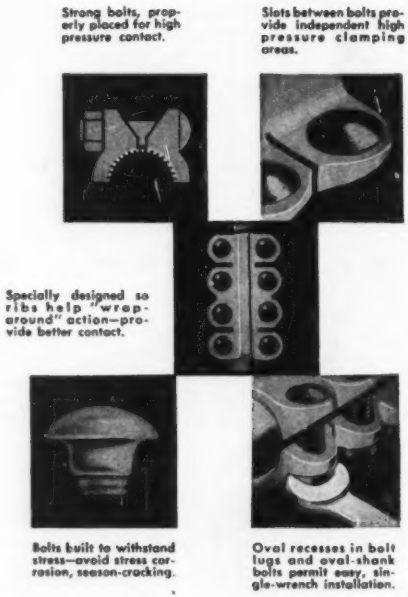
BURNDY POWER CONNECTORS

Safeguarding the service continuity of your system is an important job and one that starts at the point of connection in the substation.

Burndy Power Connectors are engineered completely to meet all the requirements of substation service. The Burndy line is complete—over 140 standard types can be supplied for your connection needs on cable, tube, bar and special shapes—on copper and aluminum conductors.

Write for Catalog 50, or for prompt personal assistance ask for the Burndy Representative.

BURNDY
POWER CONNECTORS


Strong bolts, properly placed for high pressure contact.
Slots between bolts provide independent high pressure clamping areas.
Specially designed so ribs help "wrap-around" action—provide better contact.
Bolts built to withstand stress—avoid stress corrosion, season-cracking.
Oval recesses in bolt lugs and oval-shank bolts permit easy, single-wrench installation.

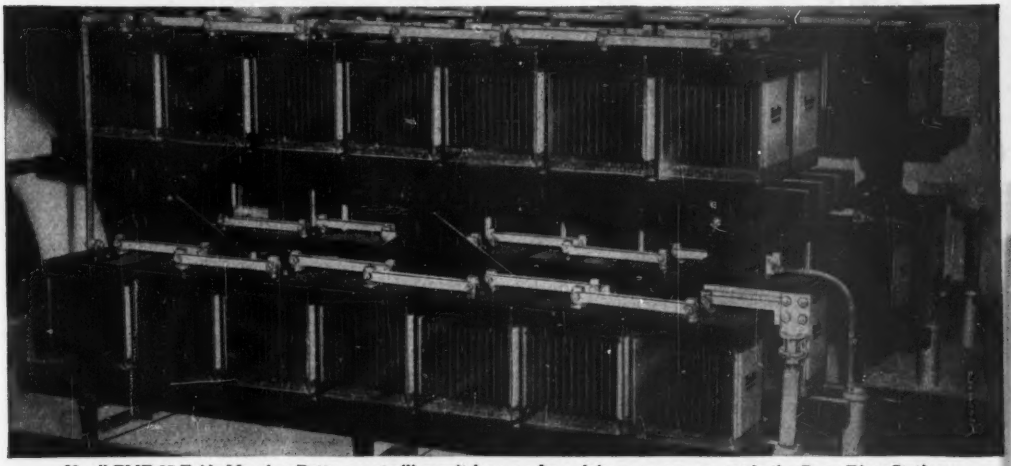
Burndy, New York 54, N. Y. • Western Branch: Vernon 58, Calif. • Burndy Canada Ltd., Toronto 8, Ontario

Exide-Manchex

provides the dependability needed by this Station Duty Cycle

Green River Power Station uses 60-cell Exide-Manchex to control switchgear, to supply power for emergency lighting, alarms and communication systems

Kentucky Utilities Company
Green River Power Station, Central City, Ky.



60-cell EME-25 Exide-Manchex Battery controlling switchgear and supplying emergency power in the Green River Station.

The Green River Power Station, a modern base load plant of the Kentucky Utilities Company, utilizes two 30,000 KW turbine-generators. It supplies power for important communities and industries in the surrounding territory through three radiating 33 KV lines, two 66 KV lines, and one 138 KV line.

The station battery—a 60-cell EME-25 Exide-Manchex—is used as a source of supply to trip and to instigate the reclosing action of seven 66 KV and four 33 KV oil circuit breakers. These are pneumatic closing, with the battery supplying power to operate the air valve which closes the breaker. Inside the plant are 31 air circuit breakers operating at 2.4 KV. These breakers are also controlled by the Exide-Manchex. The air breakers control all motors of 100 H.P. and up; all station auxiliary power. And when all else fails, a battery-operated motor-driven oil pump maintains pressure in the hydrogen oil-seal system.

Besides the switchgear control, the Exide-Manchex supplies power for 14 KW of emergency lights, which are on a throw-over switch; all alarms in the station system; and, in emergencies, all communication systems through a rotary converter.

All these duties are performed dependably—economically—by the Exide-Manchex Battery. Use Exide-Manchex in your station: For positive operation of switchgear; for an adequate and uninterrupted supply of current for all your stationary battery requirements. Exide-Manchex is your best battery buy!

ONLY EXIDE-MANCHEX BATTERIES GIVE YOU ALL THESE FEATURES:

- Exclusive long life manchester positive plate.
- Slotted plastic separators, impervious to chemical and electrical reaction.
- Plastic spacers for plate alignment.
- Latest development in molded glass jars for compact installation.
- Heavy terminal posts with copper inserts for extra conductivity to give instant high discharge.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" and "Manchex" *Reg. Trade-marks U.S. Pat. Off.*

1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

Not Only Design,

BUT FABRICATION, TOO!

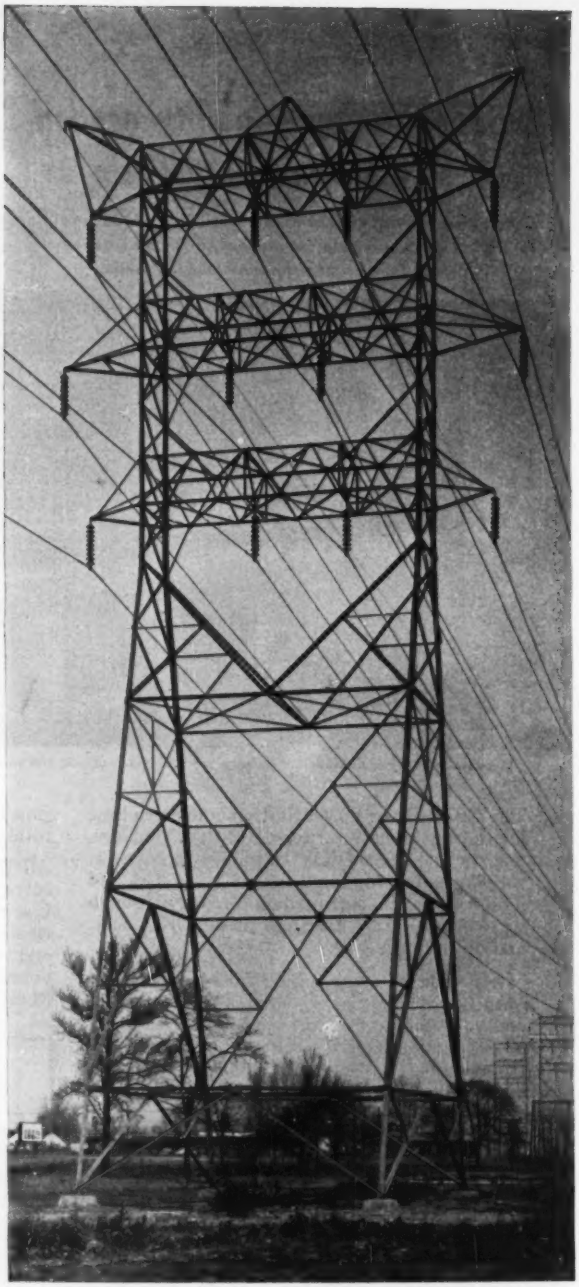
Bethlehem has the experience and the facilities to design and fabricate single- or double-circuit transmission towers to meet virtually every requirement. Bethlehem shops are well located, and are equipped to handle every phase of tower manufacture, including galvanizing.

You are invited to get in touch with the nearest Bethlehem sales office, to discuss your tower requirements.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

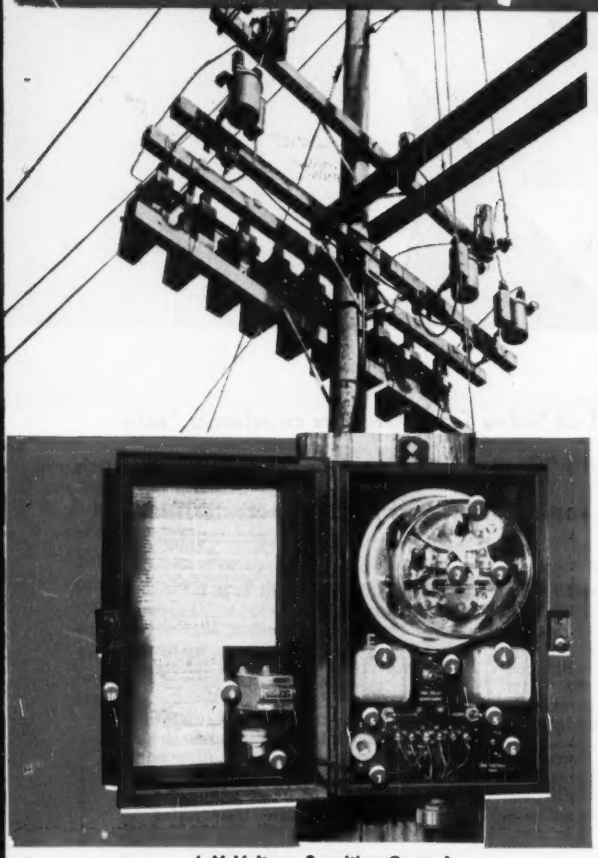
BETHLEHEM STEEL



Bethlehem designed and fabricated these towers for Consolidated Gas Electric Light and Power Company, of Baltimore. Installation consists of 7 suspension and 11 strain towers in a four-circuit, 110,000-volt line. Tower in foreground is 112 ft high; three ground wires, 1½ in. Copperweld, 25 ft on centers; over-all length of top and bottom crossarms, 44 ft; middle crossarm, 50 ft; base width, 30 ft x 41 ft; 12 conductors, 556,500 cm 24/7 A.C.S.R.; minimum conductor-separation, horizontal 10 ft, vertical 16 ft.

this 225 kvar automatic

switched capacitor installation



L-M Voltage-Sensitive Control

1. Nominal line adjustment on voltmeter—110 to 130 v.
2. Band width adjustment—2 to 12 v. with recommended minimum of three volts.
3. Time delay adjustment—instantaneous to 4½ minutes. Synchronous motor drive unaffected by variation in ambient temperature or voltage.
4. Enclosed selector relays—carry full burden of oil switch driving mechanism.
5. Toggle switches permit automatic, test, or instantaneous manual operation of oil switches.
6. Line voltage test connections.
7. Fuse protects entire circuit.
8. Spare fuse plug.
9. Operation counter (optional).
10. Weather-proof cabinet with threaded conduit nipple and multiple knockouts.

Less than $6.37 per kvar

for equipment including
Elemex Capacitors, Kyle Type GR Switches,
New L-M Voltage-Sensitive Control,
Capacitor Racks, Cutouts, and Arresters

(Only $5.92 per kvar for 300 kvar bank for 4160 volt delta or 2400 volt wye.)

This unprecedented low cost of $6.37 per kvar for small banks of automatically switched capacitors is made possible through the introduction of L-M's new control equipment. At this low cost you are now justified in installing and taking advantage of all the dollar benefits switched capacitors can give you.

L-M's New Voltage-Sensitive Control

L-M's new voltage-sensitive control has been field-tested for more than two years, and is now in full production. Although fundamentally designed for controlling the Kyle type GR oil switch, its flexibility permits its use with other solenoid or motor-driven equipment, including large breakers.

Heart of the control is basically a watt-hour meter modified to make it volt-sensitive. Over 3/8" contact travel per volt (120 volt base) assures extremely sensitive operation. Voltmeter is temperature compensated to ±1% accuracy from −30° F to 140° F. Line voltage can be determined within this accuracy without the use of external portable instruments. Once band width and midpoint settings are established, they are accurately maintained and need no periodic checking.

Voltmeter is mounted in a standard meter socket. Installation can be completed and tested before meter is installed, so that the test engineer doesn't need to be present until the line crew has finished its work.

Arc-suppression and filter circuit assures complete freedom from interference at telephone, radio, or television frequencies.

Get the whole story. Ask the L-M Field Engineer for bulletin on Elemex Capacitors and information on L-M's complete switched capacitor installation and the new voltage-sensitive control; or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

LINE MATERIAL Capacitors

Completely Coordinated Equipment for Distribution Today

PROTECTION TODAY

LENS

for a lightning arrester

Here is how L-M Valve Type Arresters counteract "skin effect," and why L-M's "Granulon" characteristic element has such high discharge capacity and unchanging characteristics.

Lightning follows the path of least resistance—electrically. Also, like 60-cycle current in a conductor, it tends to "skin" down the outside of the valve element. In a lightning arrester, when the resistances down the middle and side of the valve element are the same, the surge invariably tends to channel down the outer edges.

The result? Repeated surges lower the discharge capacity, and in time the arrester clinkers, and fails. Usually nobody knows why, and attributes the failure to a direct stroke.

In L-M's "Granulon" characteristic element, *lens-shaped metallic electrodes* shorten the electrical distance down the center just enough to counteract the skin effect. The surge discharges evenly all through the "Granulon"—and the arrester lasts far longer.

The arrester can take *more* heavy surges ... it maintains its high discharge capacity without change for years and years ... rate of failure is gratifyingly low.

(Incidentally, that is why L-M is the only manufacturer who *dares* to put his arrester into a Pyrex® glass housing. You can *see* any signs of failure—which is so rare in L-M arresters we don't mind taking the cat out of the bag!)

Other features: precision gap, maintains low sparkover and fast action on both long low and steep front waves ... draws negligible follow current—permits accurate fuse coordination ... The Isolator, L-M's patent insurance feature—the arrester can never ground feeders. In all distribution voltages ... Meets NEMA Standards and more!

GET THIS BOOKLET—JUDGE FOR YOURSELF

Ask the L-M Field Engineer for a copy of Bulletin LA1, or write Line Material Company, Milwaukee 1, Wisconsin (A McGraw Electric Company Division)

7408

LINE MATERIAL Lightning Arresters

Complete Coordinated Equipment for Distribution Today

L-M Protective Lighting is PRODUCTIVE Lighting

Protection is only *half* the story when you install L-M plant-protective lighting.

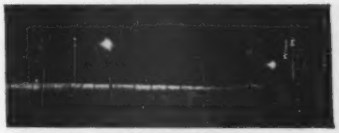
PRODUCTION, not only during the present emergency, but in the years to come, is an equally important consideration in every L-M installation.

L-M Lighting Engineers, backed by more than 35 years of experience with outdoor lighting, are designing installations which not only meet War Standards Requirements but also provide additional light on loading docks, railroad sidings, yards, storage areas, parking lots and entrances.

Dark spots are potential production-bottlenecks. They can also be scenes of lost-time accidents. By eliminating these dark areas, L-M Protective Lighting installations will continue to pay off for years to come.

No dark hideaways for intruders, even in this back alleyway. A Spherolite installation.

A lighted fence, with controlled light directed at the fence and beyond. Guards patrol roadway in semi-dark at right of picture.



Over-the-fence lighting, with glare on any approaching intruder. Typical use of L-M Fresnelite.

Two L-M Protective Lighting Units

L-M Spherolite provides 5 different light patterns. Combinations of reflectors and refractors to provide correct light pattern for almost any requirement. When equipped with L-M Autolatch, it can be serviced from ground with lamp stick; no ladder needed.

L-M Fresnelite—specially designed glare unit to provide a broad, fan-shaped light pattern. Ideal for over-the-fence lighting.

GET THIS LIGHTING BULLETIN

Ask the L-M Field Engineer for L-M's bulletin on Protective Lighting. Describes L-M Lighting Engineering Service and L-M Luminaires. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LM

LINE MATERIAL...Protective Lighting

Another Example of L-M Leadership

L-M's ORTO

(*oxidation-resistant transformer oil*)

gives you all these advantages:

- longer life for the transformer, with the same overload capacity, or . . .
- higher overload capacity with the same transformer life
- reduced oil acidity and sludging
- maintained high impulse strength

and

- ORTO mixes with any other oil, conventional or inhibited
- ORTO will not react with other inhibitors
- ORTO is available as a *concentrate* for adding to your present oil stocks, for adding to power transformer oils, and for prolonging the life of reclaimed oil

Since its announcement, which led the industry, ORTO® has been a phenomenal success. Naturally L-M and L-M research engineers are gratified by ORTO's acceptance and this acceptance was deserved, by the long, rigorous careful checking into oils and inhibitors. New accelerated test methods were developed, to make sure that ORTO was as good as expected. ORTO was thoroughly tested and proved by extensive investigation and accelerated life tests representing many years of service.

Comparative curves show the deterioration of transformer oil in service. A high-grade conventional oil deteriorates at a gradually accelerating rate. Over-refined oils may have a better response to the inhibitor; but once the inhibitor has been used up, the oil has little resistance to oxidation, and deteriorates rapidly. ORTO brand oil is a high-grade conventional oil with an inhibitor which greatly extends the beginning of the deterioration, which, when it finally starts, assumes the same gradual curve as with any high-grade conventional oil.

Ask the L-M Field Engineer for information on ORTO; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

50

LINE MATERIAL . . . Transformers

Complete Coordinated Equipment for Distribution Today

L-M's new EEI-NEMA...standard subway transformer gives you ROUND-WOUND construction *Plus*...

- reduced tank cross-section for smaller manholes
- cover-mounted high voltage wiping sleeves
- sidewall-mounted low voltage bushings with spade-type terminals
- sealed construction with welded cover
- gasketed handhole
- unexcelled performance—low losses; high short-time overload capacity

ORTO®—Oxidation-Resistant Transformer Oil—inhibited for longer life

L-M's Round-Wound® Subway transformers fully meet the new EEI-NEMA standards. They are now available. In addition to having the well-known advantages of L-M Round-Wound design, they take less vault space, have better sealing, offer greater ease in making connections, and have the advantage of being filled with L-M's ORTO.

Get the whole story! Ask the L-M Field Engineer for details; or write Line Material Co., Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

51

LINE MATERIAL... Transformers

LM

Complete Coordinated Equipment for Distribution Today

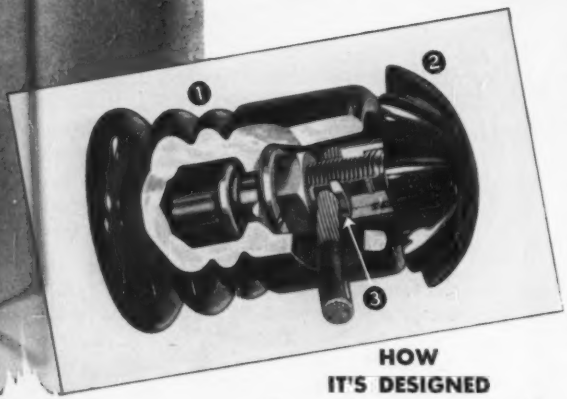
Now in Production

HERE'S L-M's OUTSTANDING

new sidewall bushing

FOR DISTRIBUTION TRANSFORMERS

← *better*
← *faster*
← *safer*



HOW IT'S DESIGNED

Heavy machined wet-process porcelain (1) with ample leakage distance. Extra strong finger-grip handle (2) will not come off accidentally, but can be removed for inspection. Heavy connector (3) machined of solid metal; conductor hole opens on one side of bushing only —conductor cannot go through to cause accidental contact; connector and hole will accommodate up to two full-size conductors. Leak-proof design inherently siphon-proof.

here's why L-M's new sidewall bushing is *better*—better for the transformer and the user because it permits lower, lighter transformers requiring less pole space . . . better because it makes a firmer, more permanent connection . . . better because of its extra strong, heavy design.

IT'S FASTER, because the lineman can make transformer connections more quickly. He inserts the bared end of the conductor into the hole in the bushing, and spins the finger-grip knob tight. That puts a permanent, firm squeeze on the conductor, assuring a good electrical connection that cannot pull out. Connector will take full range of EEI-NEMA-prescribed conductor sizes.

IT'S SAFER, because there are no exposed live parts, no sharp edges or projections to catch gloves or snag clothing. This new bushing is now standard on all L-M transformers up to 5000 volts. For complete information on L-M transformers and the new bushing, ask the L-M Field Engineer, or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL—*Transformers*

Complete Coordinated Equipment for Distribution Today

48-8

Quiet as a kitten

ELIMINATE NOISE AND RADIO TROUBLES ON 24.9 GR.Y/14.4 KV SYSTEMS WITH THIS L-M ROUND-WOUND TRANSFORMER

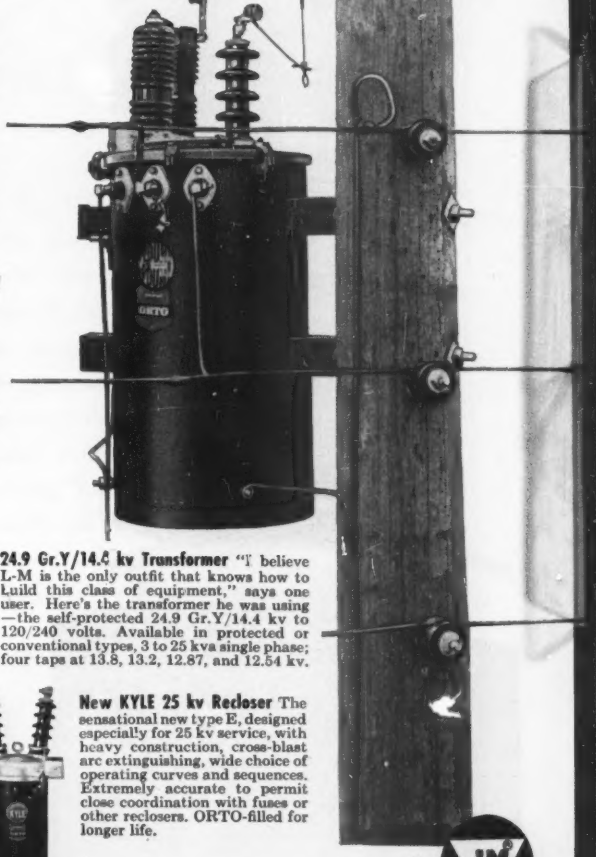
•Loose cores and leaky bushings can make lots of trouble on 24.9 Gr.Y systems. Some cores get loose and hum annoyingly. The radio noise from a poorly designed bushing can drown out a distant broadcasting station—which doesn't make the neighbors happy.

L-M has built a Round-Wound® transformer especially for this service—with a core that's quiet as a whisper—it is wound from continuous strip steel, and not cut; it stays quiet!

Oil-filled bushings are specially designed and processed—they give NO radio interference.

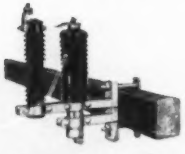
Like all Round-Wound transformers, this one has a high impulse level and high overload capacity.

The transformer and coordinated equipment have all been thoroughly tested in actual use in a number of locations throughout the country; they offer long life and dependable, economical service. Ask the L-M Field Engineer who calls on you for all the details; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



24.9 Gr.Y/14.4 kv Transformer "I believe L-M is the only outfit that knows how to build this class of equipment," says one user. Here's the transformer he was using —the self-protected 24.9 Gr.Y/14.4 kv to 120/240 volts. Available in protected or conventional types, 3 to 25 kva single phase; four taps at 13.8, 13.2, 12.87, and 12.54 kv.

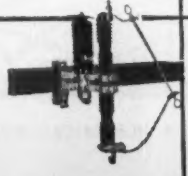
COMPLETE COORDINATED EQUIPMENT FOR 24.9 GR.Y/14.4 KV SYSTEMS



Heavy Duty Expulsion Arrester Type PF-3, 16 kv with 65,000 amp surge capacity, gives dependable protection to transformer and system.

New 24.9 Gr.Y/14.4 kv Cutout Swivel type hanger; double entrance contacts permit fusing from either side. Silver-plated solid phosnic bronze spring and contact assembly—no steel core to nick and rust!

New KYLE 25 kv Recloser The sensational new type E, designed especially for 25 kv service, with heavy construction, cross-blast arc extinguishing, wide choice of operating curves and sequences. Extremely accurate to permit close coordination with fuses or other reclosers. ORTO-filled for longer life.



Combination Arrester and Cutout Choice of swivel hanger for crossarm mounting, shown here; or for transformer mounting (shown on transformer above), top can be rotated to assure vertical fuse mounting on any size or make transformer regardless of tank diameter.

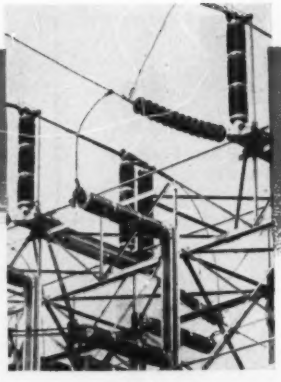
49

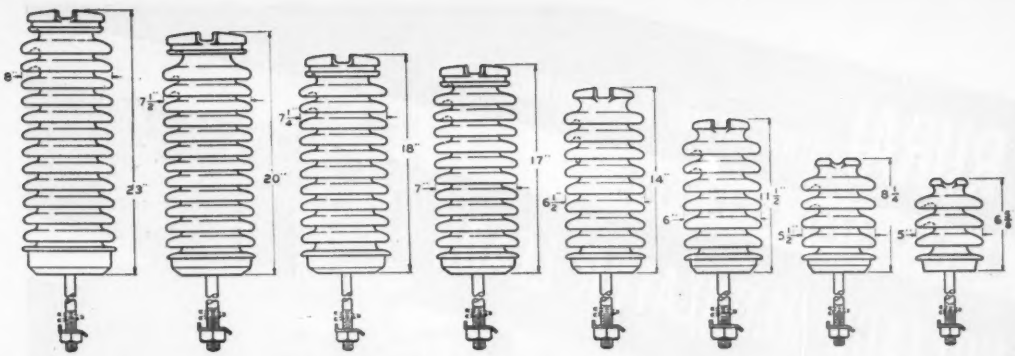
LINE MATERIAL —Transformers

Complete Coordinated Equipment for Distribution Today

THE "NEW" INSULATOR DESIGN WITH

The Lapp Station Post, incorporating the same design and performance characteristics as the Lapp Line Post, boasts an operating record unmatched by any other insulator for switch and bus support use.





9982	9366	13560	9355	9345	9335	9325	9320
9978	9466	13561	9455	9445	9435	9425	9420

THE 20-YEAR SERVICE RECORD

How much of the equipment on your system was designed 40 years or more ago? If you can think of any, would you rate it at "top efficiency" by 1951 standards? The design of most of your insulators is that old. There's been only one significant innovation in insulator design since before 1910. That innovation was the Lapp Line Post, and subsequent Station Post design. So this is the "new" design, the "different" insulator. And, we hasten to add, by the degree it's *different*, it's a better insulator. Twenty years ago we were promising . . . no radio interference . . . no puncture . . . no cracking . . . no cleaning . . . greater resistance to stones and bullets . . . better performance under arcover. And today, with a 20-year service record to back us up, we can add those things all up in saying "*Lines on Lapp Line Posts have fewer outages, require fewer insulator replacements and less maintenance than comparable lines on any other type of insulator.*"

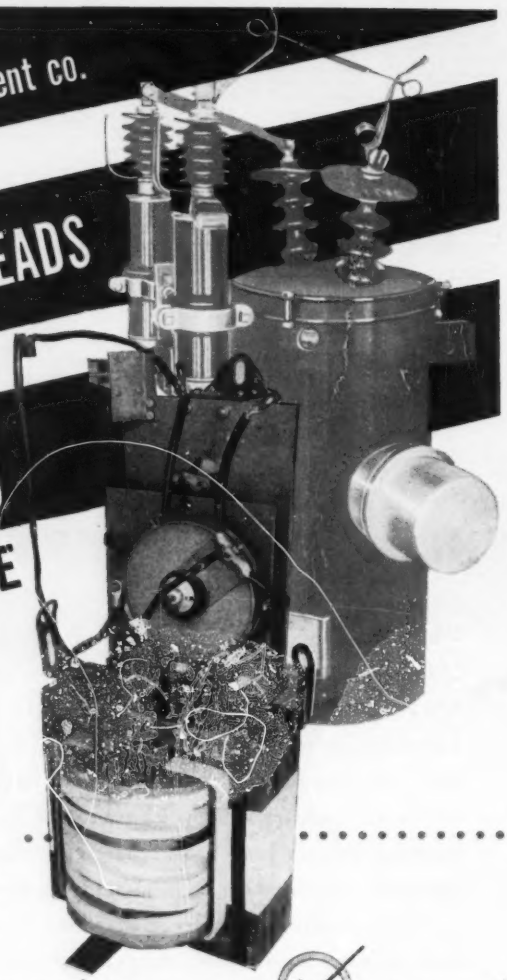
Isn't it time *your* standards got to a 1951 basis? Specify Lapp Line Posts.

Lapp

LAPP INSULATOR CO., INC., LE ROY, N.Y.

RURAL transformer & equipment co.

SINGLE STEP, LINE TYPE VOLTAGE REGULATOR LEADS ARE INSULATED AND PROTECTED WITH NATVAR 400 EXTRUDED VINYL-BASE TUBING



Newest addition to the Ruralformer line is this low cost pole mounted Type 1R Voltage Regulator. It helps save line copper and reduces customer complaints by automatically furnishing a 3.75% boost when required. This inside tank view shows core and coil assembly and the resistor side of the main switching assembly. All leads are insulated and protected with Natvar 400 extruded vinyl-base tubing.

The Rural Transformer & Equipment Co., Milwaukee, manufactures distribution transformers and associated equipment. They have developed a low cost, high surge strength transformer for distribution of rural power at 14,000 volts. With externally operated tap changer, bonded coils, and externally mounted protection against lightning surges and overload, Ruralformers carry a strong service guarantee.

Component parts and materials have been carefully picked. Natvar 400 extruded vinyl-base tubing is used to insulate and protect leads because of its consistently superior resistance to both oil and heat.

It will pay you to use Natvar 400 tubing, tape, and other Natvar flexible insulating materials for your requirements. They are available either from your wholesaler's stock or direct from our own.

THE NATIONAL VARNISHED PRODUCTS Corporation

Telephone Rahway 7-8800 — Cable Address NATVAR: Rahway, N. J.

221 RANDOLPH AVENUE ★ WOODBRIDGE, NEW JERSEY

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubings and sleevings
- Varnished identification markers
- Lacquered tubings and sleevings
- Extruded vinyl tubing and tape
- Extruded vinyl identification markers

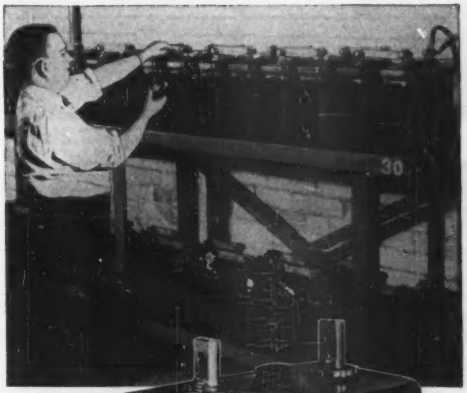
Ask for Catalog No. 21

GOULD

Plus-Performance Plan

...TELLS YOU WHY

EQUALIZING CHARGES ARE VITAL FOR MAXIMUM FULL-FLOAT SERVICE!

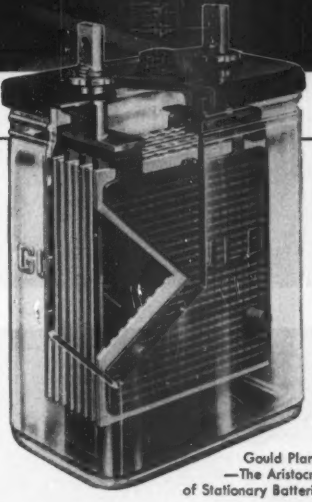


The information available through GOULD'S PLUS-PERFORMANCE PLAN is important to you. Here are manuals, articles, specifications, bulletins, record cards and charts designed solely to conserve and extend your battery power. This material describes and illustrates how to select, charge and handle, maintain and determine the condition of batteries in full-float service. It's free to all without obligation. A request on your letterhead will bring literature describing the plan by return mail.

AN EXAMPLE OF PLUS-PERFORMANCE PLAN HELPFULNESS

When Is An Equalizing Charge Necessary?

Individual cell voltages should be read and readings recorded every three months. If one or more cells are more than .05 volts below average, specific gravities of all cells should be noted for the record and the battery given an equalizing charge to bring the low-reading cell or cells up to average. This is usually accomplished by charging the batteries until there is no increase in the specific gravity of the cell or cells in question over a three-hour period. If all cells are uniform at the time of the periodic voltage test, specific gravity readings need not be taken or recorded more than once a year.



Gould Planté
—The Aristocrat
of Stationary Batteries

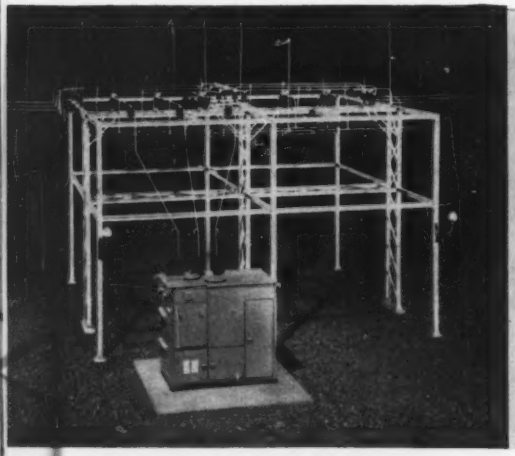
GOULD STORAGE BATTERIES

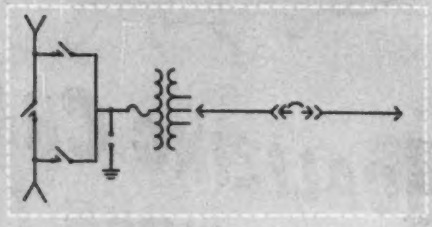
GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

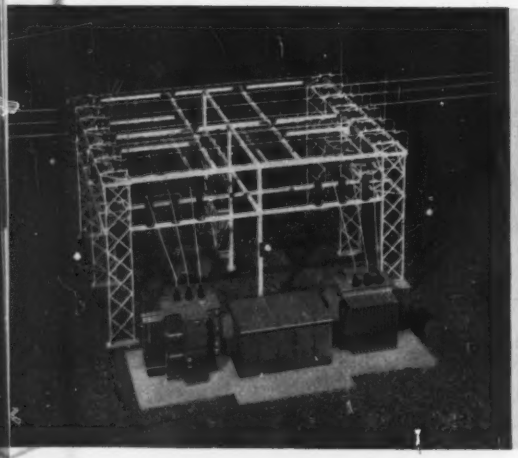
YOU CAN BE **SURE**.. IF IT'S

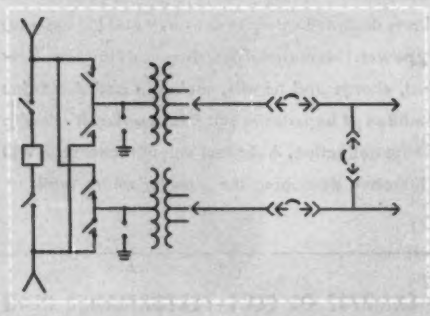
Westinghouse



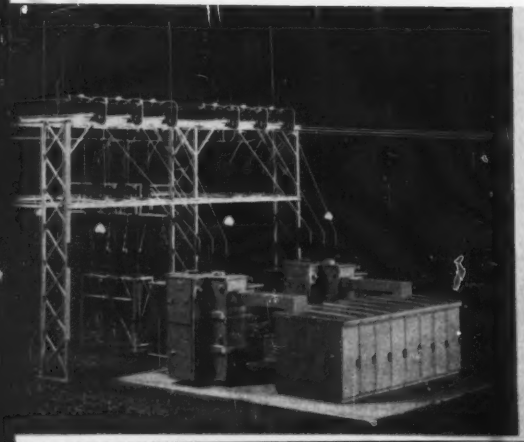


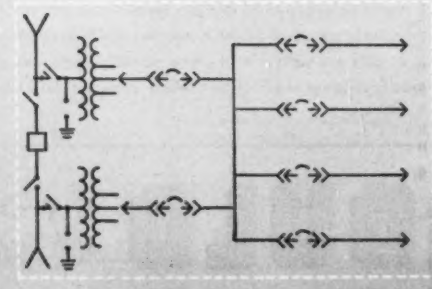
Single-feeder CSP Substation—Loop or tie subtransmission circuit—Manual sectionalization, manual selection.





Two-feeder Duplex Substation—Loop or tie subtransmission circuit—Automatic sectionalization, manual selection.

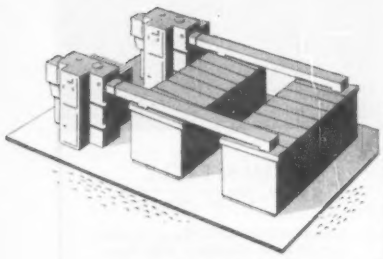




Three-or-more-feeder Spot Network Substation—Loop or tie subtransmission circuit—Automatic sectionalization.

SUBSTATIONS with A FUTURE

...lower power distribution costs



The system planning you do today must allow for future load growth, and load shifts . . . if lower power distribution costs are to be realized. The substations you choose *now* will help make this possible . . . *if they are designed with a future!*

The Westinghouse Coordinated Substations, shown here, have this "allowance for the future". They not only meet today's load demands, but provide the flexibility vital for future changes in load requirements. *They Become One of Your First Steps in Lowering Power Distribution Costs.* Their design is a result of today's modern power distribution trends. These trends are reducing distribution costs by simplifying systems and standardizing equipment. Simplifying subtransmission circuits reduces the amount of equipment used. Standardizing equipment results in production savings that are passed on to you.

Due to the compactness of these Substations, "blocks of power" can be easily and economically added or removed to take care of increased load requirements, load shifts or relocations. You realize maximum salvage value.

For more complete information, get your copy of the Coordinated Substation Book, B-4061. Ask your Westinghouse representative for it, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60728-A

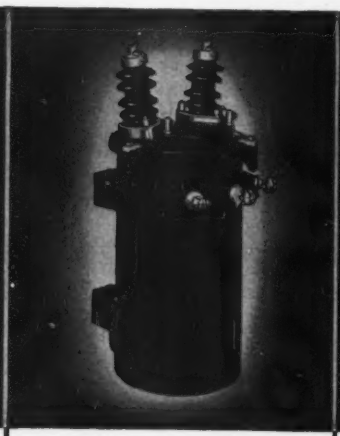
Westinghouse

COORDINATED SUBSTATIONS

MOLONEY DISTRIBUTION TRANSFORMERS
...for *DEPENDABILITY and PERFORMANCE*

CONVENTIONAL TYPE LL

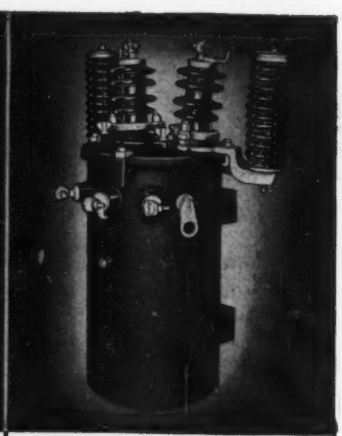
The Type LL Transformer is provided with sidewall-mounted high voltage and low voltage bushings for use on system voltages of 5000 volts or below. These transformers are manufactured in standard Kva ratings from 3 to 100 Kva. Porcelain protective caps are regularly supplied on the high voltage terminals of Type LL Transformers to protect the lineman from accidental contact with the live terminals.



CONVENTIONAL TYPE CL-2

The Type CL-2 Transformer is provided with two cover-mounted high voltage bushings. These transformers are standard in sizes 167 to 500 Kva in all voltages and in sizes 3 to 500 Kva in voltages above 5000 volts.

Transformers with a single cover-mounted high voltage bushing, designated as Type CL-1, are designed for use on grounded neutral systems. One end of the high voltage winding on this type transformer is grounded to the tank internally.



COMPLETELY SELF-PROTECTED

Completely Self-Protected Transformers are equipped with lightning arresters, internal protective links, tank grounding gaps, and secondary circuit breakers. These transformers are available in standard ratings up to 100 Kva and voltages up to 15000 volts. High voltage bushings are sidewall-mounted for voltages of 5000 volts and below and are cover-mounted for voltages above 5000 volts.

The Moloney Electric Company has a transformer to meet the requirements of any distribution system. Recognition of the fact that continuity of service is a "must" on these systems has always been a guide to Moloney engineers in the design of distribution transformers.

Conventional Distribution Transformers are available for those customers who prefer to supply their own protective equipment. For those who prefer integrally mounted protective equipment, there is available a complete line of CSP (Completely Self-Protected) Transformers. Superior electrical performance is assured in all Moloney transformers as a result of liberal design and quality control.

MEBI-11

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Editorials

Nuclear Fuel Progressing

True atomic energy is a reality only for terrific explosion and heat. There is no way known to convert it directly into electrical energy, so it is destined to enter the power field solely as a new fuel to be "burned," however, very differently from coal, oil, or gas. The apparatus in which it will be "burned" is a reactor or pile and it bears little resemblance to a conventional steam boiler.

Nevertheless, the function it performs is that of turning water into steam at as high pressure and temperature as is feasible. That conversion is the stage at which nuclear power now stands. Reactors have been built experimentally for the purpose but not much information has been divulged as to the (1) thermal output, (2) stability, (3) dependability, (4) temperature and pressure of the generated steam, and (5) the cost per kw of rating. Such estimates as have been made have largely been made by the nuclear physicists and they vary widely. This is explainable when it is realized that building, tearing down, rebuilding, modifying, and improving are inevitable steps in the effort to arrive at a practicable power pile.

Now, however, further progress can be expected because several utilities and consulting firms have been designated by the U. S. Atomic Energy Commission to prosecute the analysis. They will study the engineering and economic feasibility of building and operating power-producing reactors. These groups can bring the development out of the laboratory stage and into the pilot plant stage as rapidly as they can resolve the problems of practicable design and give assurance at the same time that costs will be advantageous by comparison with the conventional fuel-burning plants.

A reactor cannot permissibly cost too much more than a boiler because the latter and its associated equipment represent a fair third of the overall cost of coal-burning plants. Admittedly there will have to be the same or similar feed water heating and pumping as used with a boiler. Fuel and ash handling will be profoundly different and probably much more expensive per kw. The fuel itself on the other hand, may be far less expensive per million Btu. "Probably," "possibly," and "may" are the words of wisdom and caution at this turn because, as was said, nobody *knows* what atomic power plants will cost. That is what the new panel of utilities and engineering firms will try to find out.

We now have the highly significant report of the Ad Hoc Advisory Committee on cooperation between the electric power industry and the Atomic Energy Commission. Committee members Philip Sporn, president of the American Gas & Electric Co, E. W. Morehouse, vice president of the General Public Utilities Corp, and Walton Seymour, advisor on power problems to the Economic Cooperation Administration, have done an outstanding job for the industry by presenting a clear statement along with adequate recommendations for future action.

The committee's proposals include suggestions for closer study by technicians in the industry and further committee activity made up of men broadly representing the electric power industry. We agree with the committee's statement that "the prospects of an important new source of power within the next few decades are robust enough to warrant a strong present and continuing interest on the part of the electric power industry."

On Staying at Home Instead

Would it make any great difference to the electric utilities if the cost of seeing a good movie were 21¢ instead of 79¢ or even $1.50? It might not unless the audience changed its habits in a pronounced way as a result of the reduced cost of enjoying the entertainment. For example, suppose the nation should choose to stay home instead of "going to the movies." It might raise havoc with the theaters; and if it did, the power companies would lose some significant load. How much other load would be lost or how much more would originate in the homes because customers stayed there are questions that cannot now be answered.

A scheme has been devised by one of the radio television manufacturers, and it has been given an intensive tryout in Chicago. Three hundred families—some avid movie-goers, some home-bodies—were equipped with television sets that could receive the routine programs as well as controlled ones for which they paid a fee. Over their telephone circuit they received a coded set of impulses which unscrambled the distorted pictures on the screen. They were then able to see 3-hour film presentations which some had previously seen at their favorite movie theater.

Amazing as it may seem 92% of the subscribers reported after one month that they preferred seeing the entertainment in their own homes. Some may have relished avoiding the trip, others the parking fee, others the chance to escape baby-sitters. These may not be all the concomitant factors, but the fact is that only 8% preferred the idea of going to the theater. Down could go the patronages of buses, parking lots, snack bars, refreshment palaces, etc. To that extent there would be loss in utility loads.

Up, however, goes the home lighting load, consumption in the sets, cooking, ice-cube freezing and a dozen minor uses. They may well add up to several times the lost load and represent a net gain of sizable dimensions. At least the potentiality is worth exploring as an intensification of the already recognized gain from sponsored television despite the dismal commercial intrusions. Admittedly it may not all be pure gain—some of the returns may have to be devoted to reinforcement of distribution to meet the possible voltage regulation demands as well as the loadability. There might be a good margin above such an outlay.

But who knows what the outcome will be, until the facts are analyzed.

A Plan for Engineering Education

Beginning this fall, Columbia University School of Engineering will inaugurate its cooperative plan with 12 liberal arts colleges. Students entering these colleges and taking selected subjects will be permitted to enter Columbia after three years. They will, of course, be required to maintain satisfactory academic records. The university will then offer a summer school and a two-year course of study in engineering leading to a degree.

A similar plan was recently announced by Massachusetts Institute of Technology. Other engineering schools will want to investigate these ideas for possible use in their own institutions. It is a logical method of screening potential engineering students if the course of study includes preparatory subjects for engineering. It will undoubtedly act as a stimulant to registration for engineering curricula and assist in the solution of the shortage problem.

We congratulate Columbia upon this far-sighted program.

New Industrial Electrification Council

The announcement of the formation of a new Industrial Electrification Council was made recently by Robert G. Ely, chairman of the EEI Industrial Power and Heating Section, and director of sales, Connecticut Light & Power Co. Speaking at the recent EEI sales conference in Chicago, he said that the purpose of the council is—

"To foster and coordinate the dissemination to American industry of factual information on the application of electricity and electrical apparatus to industrial processes and other manufacturing operations for the purpose of developing a wider knowledge by American industry as a whole of the opportunities to increase production, improve quality, and reduce costs through the widest economic use of electricity."

Amplifying the purpose of the council, Ely said his committee hopes to:

1. "Gain appreciation by American industry that only through the widest possible electrification of plant and process will the goal of increased production of better products at lower cost be attained.

2. Accelerate the acceptance of economic electric power applications to increase further the contribution which the electric power industry has already made to industrial processing and plant operation.

3. Develop educational programs founded on accepted electric power applications to assure the widest economic use of those power applications by industry as a whole.

4. Develop training programs in industrial electrification for personnel of industry, manufacturers, and utility companies."

At its recent meeting in Chicago the EEI Commercial Division General Committee gave its approval to the formation of this council. For the utility companies, final approval is still necessary by the EEI board of directors. The electrical equipment manufacturers who have worked for the formation of the council have all given it their stamp of approval.

"Although organized to cover ultimately the entire field of industrial electrification, the council in its initial stages will devote its activities solely to the field of electric heating where it is felt that there is much work to be done."

The formation of this council is an important step toward better cooperation among the utility companies, the equipment manufacturers, and the industrial plant engineers.

The Electrical Week

INDUSTRY MOBILIZATION—CMP becomes a reality for utilities as Depa orders changes into effect (p 54)... Manly Fleischmann, administrator of NPA, nominated to take on administration of DPA in addition (p 55)... Utilities appeal to Defense Mobilizer Wilson to restore third quarter material cutbacks (p 55)... Charles W. Cornforth, Public Service Electric & Gas Co. is named assistant chief of Materials and Equipment Requirements Branch of Depa and Paul W. Hand, former manager of Central Lincoln PUD, assistant chief of the agency's Materials Control Branch (p 55).

WASHINGTON—Thomas C. Buchanan, Pennsylvania Democrat, seen as likely candidate to fill Mon C. Wallgren's shoes as chairman of FPC (p 56) ... Sporn Committee urges that AEC and the industry get together to study the use of nuclear energy in central stations (p 59) ... Interior approves Reclamation Bureau plans to construct Palisades Dam and Power Plant on Snake River in Idaho (p 60) ... FPC asked to permit Southern California Edison Co to build Mammoth Pool Project on San Joaquin River (p 60).

ELSEWHERE—You'll spend more on advertising by 1952, PUAA survey indicates (p 57)... Electric Energy, Inc, and TVA race to complete power plans on opposite sides of Ohio River to supply AEC's Paducah Project (p 58)... Inferior education will eventually deplete the supply of engineers, new AIEE head warns at Institute's summer general meeting in Toronto (p 61)... TVA is raising rates 12 to 15% to its large industrial customers (p 62).

• • •

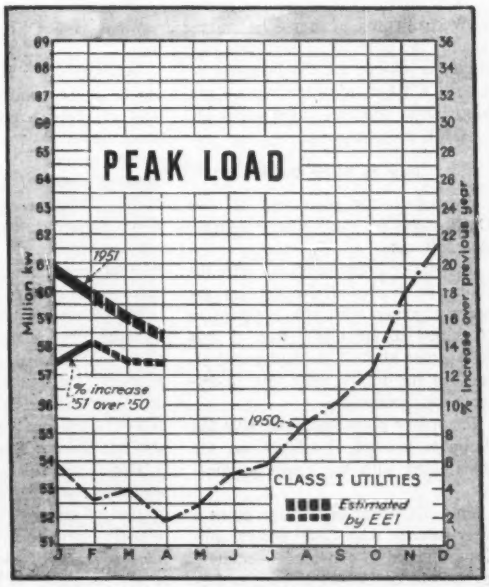
Britain's atomic scientists have come to the stage in research where they believe they will be able to start building the world's first nuclear power plant by the end of the year. The plant, an announcement said, would consist of a pile developing temperatures up to 1100 deg F. The heat, they say, will be transferred to a steam boiler to generate power in the conventional way.

In what appeared to be an orderly retreating action, Interior Secretary Oscar L. Chapman last week denied he had ever told anyone he would not approve location of additional hydroelectric-powered aluminum plants in the Pacific Northwest. Last month Mayor Delesseps Morrison of New Orleans, following a conference with Chapman, told reporters the Secretary had decided to bar construction of aluminum plants in that area. Although the Morrison statement was carried in the press, Chapman issued no denial until Electrical World asked him to amplify the statement.

A four-week executive development program for public utility executives is being offered by the University of Michigan starting next Monday. Enrolled in the first course are 55 students, ranging from president to engineer, from 24 electric utilities throughout the country.

Does Gable look better projected on the screen by private or public power? The South Carolina PSC might have to decide that at a hearing July 11. Salkehatchie Electric Cooperative, Inc, has filed a complaint that South Carolina Gas & Electric Co invaded its territory recently to supply power to an outdoor movie, "in violation of a contractual agreement."

Potential hydro capacity of South America is 11.3% of the world's total, compared with 9.2% for North America, W. A. Buchanan, Gibbs & Hill Co, told the third conference on Latin America at Stanford University last week. Utilization is the difference—we are utilizing 19.7% of ours, South America only 0.7%.



CMP Becomes Reality to the Industry as Depa Orders Changes into Effect

CMP became a reality for electric utilities last week as Defense Electric Power Administration ordered the new system of material allocations into effect for major plant additions and minor requirements.

Depa urged all utilities to convert their DO ratings for delivery of controlled materials during the third quarter to authorized controlled material (CMP) orders. This can be done whether the orders have been placed or not. Controlled materials are copper, aluminum, and steel in the various forms and shapes listed in CMP Reg. 1.

JAMES F. FAIRMAN, deputy administrator of Depa, who officially went to work today as head of Depa, succeeding C. B. McManus of Southern Co

Procedures Spelled Out

The agency spelled out specific procedures for submitting new CMP-rated orders and converting the ratings on orders already placed. Retiring Depa Administrator Clifford B. McManus said CMP should give greater assurance that material deliveries are made, once the proper authorization is given. In cases where DO-48 orders have been turned down by suppliers, it was suggested they be placed again with the CMP designation.

New orders placed on old orders converted would, of course, be charged against the quantity of materials each utility is allotted for third-quarter delivery. CMP-rated orders require previous Depa approval either under DO or CMP programming.

How to Place Orders

Procedure for placement of new CMP orders for third-quarter delivery is as follows:

For major plant additions, affix the allotment symbol H-3-3Q51 on the order together with the certification "Certified under CMP Reg. 6 and NPA order M-50." An authorized official of the utility must sign underneath the certification.

For minor plant additions, affix the allotment symbol H-4-3Q51 on the order along with the above certification.

Since DO-rated orders are given a lower priority than CMP orders, utilities are urged to convert immediately any DO-48 or DO-48 (minor) orders already placed. This may be done by furnishing the supplier a revised copy of each delivery order or a memorandum clearly identifying such delivery order, and supplying the following information:

For major plant additions, affix the allotment symbol H-3-3Q51 to the revised copy or memorandum and use the above certification.

For minor plant additions, affix the symbol H-4-3Q51 and the certification.

Authorizations to use DO-48 ratings apply to the controlled material content of class A products other than stock items.

For example, a steel tower is a class A product for which DO-48 ratings have been required. Under CMP the allotment will work in much the same manner. The utility makes its allotment to the fabricator, who, in turn, passes it on to the mill.

In the case of controlled materials as such, the purchase order is the allotment, but in the case of class A products the purchase order would contain the rating DO-H-3 or DO-H-4, and the allotment would be made on a separate form attached to the order.

This form, which is not yet widely available, but which may be duplicated by the utilities, would be used to give a quarterly breakdown of the quantities of each of the controlled materials required. It would carry the allotment number "H-3" or "H-4" along with the signature and title of an officer of the utility.

For any major plant addition for which utilities have received authorization from Depa to order controlled materials or use such materials on hand, the directive authorized utilities to order materials other than copper, steel, and aluminum by use of DO-H-3 rating. This rating would be affixed to such orders along with the certification above. This rating may also be applied to orders previously placed.

If any order so rated is for a class A product, the utility must furnish an allotment along with such order. However, if the item ordered by use of the DO-H-3 rating is a class B product, an allotment form is not required. In general, Class B items are shelf items such as pole line hardware. Lists of Class A and B items are being prepared by Depa and will be sent to all utilities shortly.

Under CMP, there will be provisions for obtaining materials and products not in the CMP class for minor requirements by use of a DO-rating, but procedures have not yet been worked out. For the present, electric utilities may continue to obtain materials by use of the DO-97 rating.

Orders for turbines, generators, and other heavy equipment of this type will be handled under procedures to be announced by the National Production Authority. Materials for such equipment is not within the jurisdiction of Depa.

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Defense Guide for Small Business Issued by DPA

"Mobilization Guide for Small Business," a 31-page booklet, has been issued by Defense Production Administration to assist small- and medium-sized firms in meeting defense needs and producing consumer goods. The booklet covers defense contracts and procurement, civilian production, financing, production and facility control methods, management assistance, and gives sources of National Production Authority orders and regulations.

Copies of the booklet are available at regional offices of the Department of Commerce. National Electrical Manufacturers Association has copies available under the title "NEMA Defense Production Bulletin 340."

Utilities Appeal to Wilson to Restore Material Cuts

In a last ditch effort to restore third quarter material cutbacks, electric utility men last week took their case to top defense mobilizer Charles E. Wilson.

Ten members of the Electric Utility Defense Advisory Council reported, following the meeting, that they were encouraged. However, they declined to say what assurances—if any—Wilson had given them.

The Wilson conference followed an emergency meeting of the council called by Clifford B. McManus, retiring administrator of the Defense Electric Power Administration. During this meeting, members talked with Interior Secretary Oscar L. Chapman, but evidently received little encouragement from him that something would be done.

The council decided it would attempt to sell its case for the necessity of increased material allotments to Wilson before discussing means of curtailing the power expansion program planned by utilities.

Manly Fleischmann, NPA Director, Nominated to Head DPA in Addition

Manly Fleischmann, boss of the National Production Authority, has a new job: Heading up the Defense Production Administration, top planning agency for production controls. If, as expected, the Senate approves his candidacy, he will step into DPA at about the worst conceivable moment.

Likelihood of an end of fighting in Korea is rapidly setting the stage for a letdown on defense production. Already you hear talk among businessmen coming to Washington of the possibility of relaxing all controls, including those on production materials. Also, the steam behind actual production of defense items is likely to drop even lower.

That will give Fleischmann more than his quota of headaches, since DPA's prime job is to see to it that output of both military and supporting goods and services stay on schedule.

Criticism of DPA had mounted to the point where there was talk in responsible quarters of abolishing the agency. But it was obvious that someone had to ride herd on the several agencies exercising materials controls and production expansion powers. After searching in vain for a top businessman to head DPA—several refused—Wilson turned to Fleischmann as the most promising administrator in the sprawling mobilization hierarchy.

MANLY FLEISCHMANN, NPA administrator nominated to take on additional job as head of Defense Production Administration and coordinate work of both

But Commerce Secretary Sawyer, who got NPA set up in his department last fall and has kept it there, had objections. It would be hard to replace Fleischmann at NPA.

So Wilson compromised. For the time, at least, Fleischmann will wear two hats, one as boss of DPA, the other as acting administrator of NPA. It would be tough on Fleischmann, but it would solve another problem worrying Wilson—the lack of DPA-NPA teamwork.

Actually it's an arrangement that can't last, most mobilization experts believe. Making DPA run as it should is a full-time job, and no one expects Fleischmann to take his new duties lightly. Sooner or later, NPA probably will get a new boss.

Fleischmann, who is 43, is expected to make many changes at DPA, staff-wise as well as in operations. Acting Administrator Edwin T. Gibson, whom he succeeded, and a few other key officials have agreed to stay on for a while to help.

Two Personnel Changes Made by Depa Branches

Two personnel changes were announced last week by the Defense Electric Power Administration.

Charles W. Cornforth of Washingtons Crossing, N. J., has been made assistant chief of the Materials and Equipment Requirements Branch.

Paul W. Hand of Newport, Ore., has been appointed assistant chief of the Materials Control Branch.

Cornforth was formerly with the Public Service Electric & Gas Co, Newark, N. J., and Hand was formerly manager of Central Lincoln Public Utility District, Newport, Ore. Both have been with Depa for several months.

CHARLES W. CORNFORTH, Public Service Electric & Gas Co, Newark, N. J., is the new assistant chief of Materials and Equipment Requirements Branch of Depa

PAUL W. HAND, formerly manager of Central Lincoln PUD, Newport, Ore., is now assistant chief of Materials Control Branch of the power controls agency

ROBERT I. MILLONZI, right, being sworn in as member of SEC by Supreme Court Justice Robert H. Jackson. A Buffalo (N. Y.) lawyer, he will fill vacancy created by resignation of Edward T. McCormick for the term ending June 5, 1952.

Buchanan May Be Named Chairman of FPC to Succeed Mon C Wallgren

Most likely candidate for the chairmanship of the Federal Power Commission is Thomas C. Buchanan, Pennsylvania, Democrat, who is now vice chairman under a rotating plan. The present chairman, Mon C. Wallgren, has announced his decision to quit before the end of August.

Second choice among the commissioners would probably be Harrington Wimberly, a Democrat from Oklahoma, who has also served as vice chairman.

Wallgren, a personal friend of President Truman, has already talked with the President about the qualifications needed by his successor. It is believed he recommended the chairmanship be filled by someone already intimately acquainted with the commission's work.

Should Truman take this advice, he would seem almost certain to elevate one of the present commissioners. The alternative would be to appoint a staff member as chairman, which seems unlikely.

But the vacancy on the commission means the FPC staff will furnish at least one possible candidate. The name of Charles W. Smith, Chief of the Bureau of Accounts, Finance, and Rates, is likely to come up again.

On Capitol Hill, where the lawmakers usually have a candidate handy for a choice government position, two persons are being mentioned for the vacancy. They are former Congresswoman Chase Going Woodhouse of Connecticut, now working with the Office of Price Stabilization, and Irving A. Hoff, administrative assistant to Sen Warren C. Magnuson of Washington.

Hoff has had some experience in the electric power field both before coming to Washington and in working on legislation with Magnuson.

In other circles the name of William E. Warne, assistant Secretary of Interior, occasionally comes up as a possible candidate.

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Scussel Becomes Chief

Frank G. Scussel has been promoted to chief of the Resources and Development Division of the Region III Branch of Power Utilization of the Bureau of Reclamation.

Chicago Utility Announces 660-Mw Expansion Plan

Commonwealth Edison Co, Chicago, has announced plans for an increased expansion program which will include five additional generating units totaling 660,000 kw. The company will require $250 million through outside financing in the next four years to carry out expansion in generating, transmission, and distribution facilities.

New units in the joint program of Commonwealth Edison and Public Service Co of Northern Illinois include two 150,000-kw units at the new Will County Station, to be built by Public Service; one 60,000-w unit at Public Service's Dixon Station: and two 150,000-kw units at Commonwealth Edison's Ridgeland Station. This new capacity, scheduled for completion in the fall of 1954, will increase system capacity to 3,722,000 kw and will make a total of 1,434,000 kw added in the nine year postwar period. This will however, provide a generating reserve of no more than minimum.

Cost of the scheduled construction program for the 1951-54 period is estimated at $450 million, of which $200 million will be provided out of cash resources, $49 million from sale of sinking fund debentures, and from undistributed earnings.

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Pope Retires From TVA

James P. Pope, after serving a nine-year term, has retired as a member of the board of directors of the Tennessee Valley Authority.

CHESTER H. LANG, well known General Electric Co vice president, last week was assigned the new job of vice president in charge of public relations

You'll Spend 3% More on Ads by '52

That's the Forecast of PUAA's Fifth Utility Advertising Survey; Sales Advertising Expected to Climb Least of 3 Chief Activities

When the last piece of utility copy slides across the advertising manager's desk the Friday before the New Year, the electric industry will have pushed its advertising expenditure more than 3% higher than last year.

This forecast was made in the fifth annual analysis of Utility Advertising and Public Relations Expenditures conducted by the Public Utilities Advertising Association. The survey covered 111 electric and combination companies serving 26 million users of electricity.

Despite all talk of continued selling, the survey indicated, appliance sales advertising is expected to expand least during 1951. The increase will be 0.7% compared to 4.6% for institutional and 2.8% for promotional advertising. Sales advertising is expected to drop to 11.5% of the industry's overall budget, compared with 11.8% for 1950. The item itself is small compared to 40.3% spent for institutional and 48.2% for promotional ads last year.

The survey showed advertising men still feel you can't beat the newspapers for getting a utility's message across to its customers. The electric companies plunked down 35¢ of every dollar they spent on advertising to buy space in the papers, and threw in an additional 4¢ to pay production costs of newspaper ads.

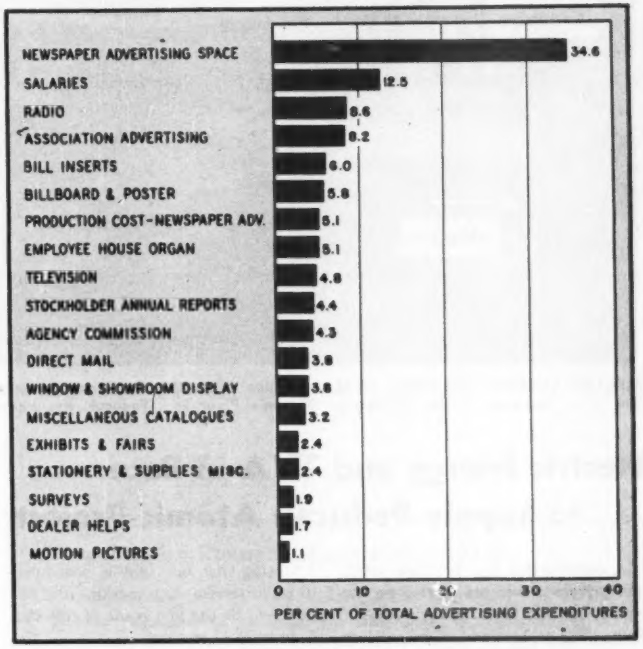
Radio time got second preference, and took an 8¢-chunk out of the dollar. And for the first time in the history of the survey, television grew to a size where it could be separated from radio for evaluation. Hopalong Cassidy and his boys haven't quite got the utilities rounded up—they grabbed off only 1% of total outlay — but they're well on the way.

At the recent PUAA conference in New York, almost every advertising man whose company was in an area accessible to TV said he intended to give that medium preference over radio during the coming year.

Of the companies surveyed, 32% said they intended to increase their advertising budgets during the year. Only 9% figured they were spending too much and would have to cut back. The other 59% said they planned to stand pat.

Although there appears to be a slight upward trend in the amount spent for advertising per customer, amount spent compared to gross revenue has been going down steadily since the war.

Average spent per customer during 1950 was $.70, up a nickel over 1949. Expenditures ranged all the way from $.12 to $1.96. During the year, percentage of gross revenue spent for the purpose dropped from .64 to .62.



HOW UTILITIES' advertising dollar was divided in 1950 is shown on the chart

Trend of Utility Advertising Expenditures
(P. U. A. A. Surveys)

ADVERTISING EXPENDITURES PER CUSTOMER

Type of Company	1940	1946	1947	1948	1949	1950
Electric	$0.63	$0.83	$0.76	$0.82	$0.82	$0.82
Combination	0.48	0.44	0.56	0.57	0.60	0.64

ADVERTISING EXPENDITURES AS PER CENT OF GROSS REVENUE

Type of Company	1940	1946	1947	1948	1949	1950
Electric	$0.68	$0.74	$0.61	$0.62	$0.62	$0.59
Combination	0.64	0.52	0.58	0.54	0.59	0.58

ELECTRIC ENERGY'S 500,000-kw plant near Joppa, Ill., will join with Tennessee Valley Authority's Shawnee Plant in supplying atomic energy project under construction near Paducah, Ky. Aerial view looks south toward the Ohio River

Electric Energy and TVA in Race to Supply Paducah Atomic Project

A construction race between public and private power has started on the banks of the Ohio River west of Paducah, Ky. Involved in the race are two power plants which will provide capacity of more than a million kw needed for an atomic energy plant being built near there.

Each of the plants will have capacity in excess of 500,000 kw. One will be built by private interests on the north side of the river, one mile west of Joppa, Ill., the other by the federal government on the south side near Shawnee, Ky., some four miles east of the Joppa Plant site.

The Joppa Plant is being built by Electric Energy, Inc, an organization of five electric utility companies: Union Electric Co of Missouri, Illinois Power Co, Central Illinois Public Service Co, Kentucky Utilities Co, and Middle South Utilities Co.

This plant will have four units of 160,000 kw capability each. Steam will be at 1,800 psig and 1,050 F. The first unit is scheduled to go into operation in September, 1952, and following that one unit is scheduled to go in service each month. It is believed to be the first plant of this size to be built all at once.

The government plant, on the south side of the river, is being built by the Tennessee Valley Authority on the property of the Atomic Energy Commission. It will have four units of 150,000 kw capacity each. First unit is scheduled to go on the line in December, 1952.

To be known as the Shawnee Plant, the installation will follow the layout of TVA's first large steam installation at New Johnsonville.

It got off to a head start in the power race, and is now running apace with Electric Energy's installation.

TVA'S SHAWNEE PLANT site shown as excavation got underway recently. Plant is on the south side of the Ohio River four miles east of Electric Energy's site

Sporn Group Urges AEC, Industry Study Atomic Power Plants Jointly

The electric power industry and the Atomic Energy Commission should get together now for the time when nuclear energy will be used to fuel central stations.

This is the principal conclusion reached by the special Sporn Committee set up by AEC last year to see what joint action between the industry and AEC researchers might produce, and to suggest means for industry participation. The committee made its report in March; it was released June 22.

Asks Setting Up of Committee

No. 1 recommendation: Creation of a 10 to 15-member permanent industry advisory committee, comprised of top executives and engineers from the electric industry.

This top-level group would work with AEC in much the same fashion that utilities now exchange information and problems with equipment makers. The committee, headed by Philip Sporn, president of American Gas & Electric Co, thinks men from the industry might already have many of the short cuts in hand to establish atomic reactors as a source of fuel for electricity.

Industry Could Supply Technicians

The report said the industry through its committee could supply top technicians to the AEC research program to work on specific problems. And it suggested that sometime in the next few years AEC should take on 25 technicians for about one year, thus building up a reserve of experts.

AEC Chairman Gordon Dean said the Sporn plan was a good idea, but there should be more discussions before anything is decided.

The Sporn report recommendations dovetail with the recently announced program of AEC for a study of the economics and feasibility of using the atom for electric power. In May AEC let a group of industries in on reactor development projects (EW, May 28, p 12.)

The permanent committee, the report said, could become the instrumentality for setting up one or more projects participated in by the electric utility industry in its entirety.

The Sporn Committee felt the electric industry's biggest contribution to the atomic question right now should be to study all factors entering into final cost of electric energy production to bring about the most economical result. Among specific problems to be dealt with in this field, the report said, are:

Capital costs of reactors and their complimentary parts to give total investment costs in a complete system of electric power generation.

Dependability of reactors, that is, the proportion of the time that reactors would be reliably available for power supply at full capability.

Costs of reactor maintenance; costs in starting and stopping units.

"Electric systems," the report added, "are likely to be the principal medium for distributing to the public whatever benefits are to flow from nuclear fuel."

Question as to whether and when atomic power will become commercially feasible was left up in the air. All depends on the commission's nuclear reactor program, which—except for piles producing plutonium for bombs—is still in the research and pilot plant stage.

While none of the reactors presently a part of the AEC program have been designed primarily with an eye to industrial power production, AEC has said it will give "impetus to the ultimate use of nuclear energy" for such purposes.

On one of the most vital points of interest to the industry—cost—the Sporn Committee made this observation:

"There is little if any prospect that the overall cost reduction could be revolutionary, but the results could be significant, especially for a number of industrial operations which any appreciable lowering of power costs would stimulate."

Besides the cost factor, the committee said, two other features of atomic power may prove attractive to the power industry. One of these is the compactness of a reactor as compared to conventional fuels. The other is extensive supplies if the breeding method is perfected.

'Prospects Are Robust'—Report Highlights

Conclusions:

1. ". . . prospects of an important new source of power within the next decades are robust enough to warrant a strong present and continuing interest on the part of the electric power industry.

2. "There is little if any prospect that the overall cost reduction could be revolutionary, but the results could be significant . . .

3. ". . . electric systems are likely to be the principal medium for distributing to the public whatever benefits are to flow from nuclear fuel.

4. "This area of mutual interest — that is the domain of utility economics—impresses us as the most important in which to establish contacts between the commission and the industry.

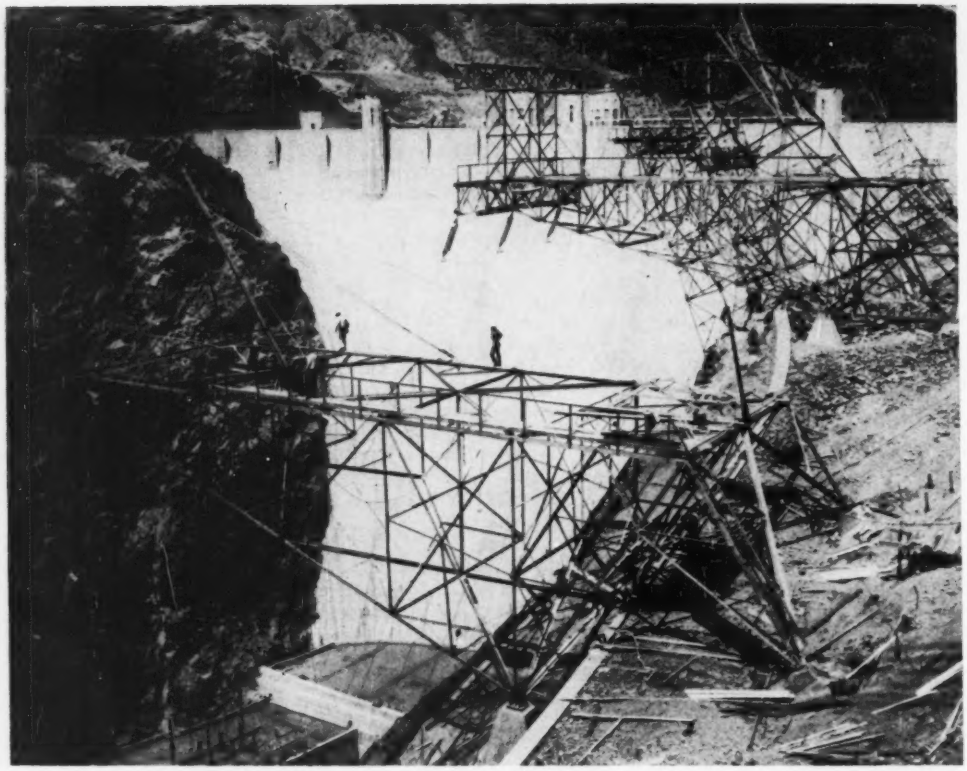
5. "In order that the power industry may obtain a part in atomic energy at all comparable to the useful role it has had in the development of conventional power equipment, it must first become educated about the subject."

Recommendations:

1. "We believe that a permanent (industry) committee should be set up and suggest that its first assignment should be to provide organized power industry assistance to the various commission projects in identifying the places where industry personnel could be helpful and to locate the personnel within the industry who might be detailed to fill these needs.

2. "(Its second assignment) should be essentially a responsibility to make reports to the power industry . . .

3. "The permanent industry committee should not only plan an important part in catalyzing and helping shape such (power nuclear research) projects but may possibly become the instrumentality for setting up one or more projects participated in by the power industry as a whole."



ADDITIONAL TOWERS to carry two 69-kv transmission lines at Hoover Dam are nearing completion. Towers jut out over the 600-ft sheer walls of Black Canyon. These towers will carry power from new generating units now being installed

Palisades Dam Approved as a Defense Project

Interior Department has endorsed construction of Palisades Dam and Power Plant on the Snake River, Idaho, as a defense project.

Interior Secretary Oscar L. Chapman, in approving the recommendation of the Defense Electric Power Administration, said he would ask Congress for an immediate appropriation to begin construction.

Reclamation Bureau plans call for an installed capacity of 112,500 kw, and it is estimated that in a median water year, the dam will produce approximately 500 million kwhr.

Chapman's move came in the face of House cutbacks of funds requested for government power projects.

Acting on the Army appropriations, including funds for Corps of Engineers' projects, the House completely rejected requests for money for the following projects:

Buford Dam, Ga.; Dalles Dam, Wash. and Ore.; Old Hickory Lock and Dam, and Center Hill Reservoir, Tenn.; Ice Harbor Dam, Wash.; Albeni Falls Reservoir, Idaho; and Gavins Point and Oahe Reservoirs, S. D.

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FPC Approval Is Asked for San Joaquin Project

Southern California Edison Co has asked the Federal Power Commission for a license to build a dam and power plant, to be known as Mammoth Pool Project, on the San Joaquin River in California.

The powerhouse would contain two 63,000-kva vertical generators with a combined capacity of 169,000 hp. Overall cost is estimated at $39,044,800.

FPC Ordered to Modify Idaho Power Co License

The Federal Power Commission has been instructed by the United States Court of Appeals to modify its order granting a license to the Idaho Power Co to build a power dam and plant on the Snake River in south-central Idaho. Among the conditions of the license, the commission required that the company agree to increase the capacity of its lines at government requests and thereafter to transmit government power.

In its decision, the court denied the commission's authority to impose such a condition upon a license for a power plant upon federal lands. However, the court stated that if the commission believed it to be in the public interest to include the condition in power-project licenses, it should present its opinion to Congress.

U. S. Delegation to Attend IEC Meeting in Portugal

Prominent American executives will participate in the International Electrotechnical Commission's meeting to be held in Estoril, Portugal, July 4-12.

The U. S. delegation is headed by Dr H. S. Osborne, chief engineer of American Telephone & Telegraph Co, who is president of the United States National Committee of the IEC.

Other members of the committee are: R. C. Sogge, General Electric Co; Vice-Admiral G. F. Hussey, Jr, (USN, ret), American Standards Association; H. R. Arnold, Westinghouse Electric Corp; V. L. Cox, General Electric Co; Professor C. L. Dawes, Harvard University; C. W. Falls, General Electric Co; C. M. Laffoon, Westinghouse Electric Corp; E. F. Seaman, Navy Department; C. F. Wagner, Westinghouse Electric Corp; W. C. Wagner, Philadelphia Electric Co; and J. W. McNair, American Standards Association.

The American group is scheduled to take part in IEC technical committees on power switchgear, insulation, electronic components, definitions, rotating electrical machinery, turbogenerators, motor dimensions, standard voltages and currents, transformers, and coordination of insulation.

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Utility Grants Pay Raise

Agreement has been reached by the Dayton Power & Light Co and the Utility Workers Union, Local 175, calling for a 6¢-an-hour general wage increase for 2,100 company employees. The raise is retroactive to May 16. It was also agreed that an additional 5% will be paid when a government announcement is made authorizing additional wage increases under the wage freeze.

$20,000 Well Spent

Danny Armstrong, 21, is back at work in London, Ont., 10 months after a 110-kv flash at an Ontario Hydro project burned almost his entire body. It cost Ontario Workmen's Compensation more than $20,000 for cortisone and other drugs to bring him back to health.

GODFREY IN COLOR was the prospect last week as CBS put its first commercial color TV show on the air in New York. Here Arthur gives the pitch on a sponsor's product as Faye Emerson waits to do her bit. RCA, which failed to receive commercial approval for such colorful goings-on, announced it would begin public demonstrations of its all-electronic system on Monday

Inferior Education to Deplete Supply of Engineers, AIEE Head Warns

The supply of engineering students will dry up at its source if present trends in the curricula of secondary schools are continued, Fred O. McMillan, newly elected president of the American Institute of Electrical Engineers, warned delegates who attended the summer general meeting at Toronto, Canada, last week.

To remedy the situation, McMillan asked members of the AIEE to cooperate fully with the Engineers Council for Professional Development and urged ECPD to study secondary educational programs offered to pupils preparing to enter engineering colleges.

"Too often," the new president pointed out, "secondary school programs are designed for the two-thirds of the high school graduates who will not continue on in college. These programs, therefore, are inadequate for the one-third who want to go to college."

McMillan said that for the coming fall term only 58% of the high school graduates who applied for admission to the Oregon State College Engineering School was accepted. The remainder failed to qualify in mathematics because of deficiencies in secondary education.

The 1950 Lamme Medal was presented to Donald I. Bohn, chief electrical engineer of the Aluminum Co of America, for his work in developing a high-speed circuit breaker for use with mercury arc rectifiers. Preceding the presentation of the award by retiring President Titus G. LeClair, the history of the Lamme Medal was given by Arthur H. Kehoe, Consolidated Edison Co of N. Y., chairman of the Lamme Medal Committee. The medalist's career was reviewed by Thomas D. Jolly, vice president and chief engineer for the Aluminum Co of America.

In his closing speech, LeClair said AIEE must inspire progress in the electric utility industry by assuming leadership in spreading technical information and know-how and by continuing its efforts to attract young engineering graduates into the field.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1951									
June 21	3.04	3.12	3.21	4.07	4.32	4.66	5.67	6.34	7.25
June 14	2.95	3.00	3.14	4.05	4.26	4.64	5.66	6.34	7.21
END OF QTR.									
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25
2nd 1950	2.68	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50

Data: Reis & Chandler, Inc.

TVA Is Raising Rates from 12-15% to Its Large Industrial Customers

Tennessee Valley Authority is raising its rates to big industrial customers on an average of from 12 to 15%.

At present the federal agency has no plans to increase rates to residential, farm, commercial, and small industrial customers.

The rate boost, which will vary from company to company depending on the load factor, will bring the cost of electricity to close to 6 mills per kwhr for big industrial users. The increase is expected to bring in an additional $2.5 million a year in revenues for TVA.

Main factors in the rate increases are TVA's large expansion program with a shift to more costly steam generation of power and large defense demands which the authority is having difficulty in meeting.

TVA officials estimate that the system will fall 10% short of meeting its peak load this winter. To make up the deficit, power will have to be purchased from neighboring private power companies. For the fiscal year which has just begun this is expected to cost TVA $11,250,000. For the fiscal year just ended the figure was $1.5 million and for the year before $400,000.

Operating costs for the federal power agency are up sharply, too. In the current fiscal year they are expected to reach $38,663,000 compared with $19,747,000 for the fiscal year just ended and $10,738,000 for the previous fiscal year.

Among the companies negotiating contracts with TVA or which will do so soon are Aluminum Co of America, Reynolds Metals Co, and Monsanto Chemical Co.

Despite the higher rates, however, there has been no letdown in the movement of large industries to the TVA area. This year a dozen or more major companies have announced plans to build plants or enlarge existing ones.

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Oklahoma Gas & Electric to Get Refund from State

The Oklahoma State Supreme Court has ruled that the state cannot charge Oklahoma Gas & Electric Co twice for the same thing; so the utility will get $12,578 back from the state as a result of the decision.

The utility filed suit in 1947 to reclaim the money after paying under protest a fee of $12,578 for increasing its capital stock $12,578,900 to $65,810,000. The state charges at the rate of $1 per $1,000 for capital stock increases.

Oklahoma G&E, however, contended it should not have to pay the fee because it had paid a similar fee in 1929 to increase its capital stock to $80 million. In district court the state's position was upheld, but the utility appealed the decision to the supreme court. The supreme court ruled that as long as Oklahoma G&E does not increase its capital beyond $80 million it will not have to pay any fees and ordered the state to refund the $12,578.

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PUC Decision Appealed

The decision of the New Jersey Public Utility Commission denying New Jersey Power & Light Co an annual rate increase of $975,000 annually has been appealed by the company. The appeal was filed with the Superior Court of New Jersey Appellate Division. The company's request for a rate increase of about 11% made a year ago May was denied by the commission on April 27.

FINANCIAL BRIEFS

Electric Energy, Inc, has received permission from the Securities and Exchange Commission to sell $100 million of 3% first mortgage bonds to two insurance companies. Proceeds will be used to construct power facilities to supply the Atomic Energy Commission's Paducah, Ky., plant. Construction costs are expected to be $90 million. The remainder of the money will assure sufficient funds in the event of rising prices.

Indiana & Michigan Electric Co has received Securities and Exchange Commission authorization to borrow $7 million up to Dec. 31, 1952. The funds will be used to finance the company's construction program during 1951 and 1952.

Electric Utility Financing—June 16-23

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Texas Electric Service	1st mtg, 3¼%, 1981 new money	$11,200	100.85%	3.33%
Missouri Power & Light	1st mtg, 3⅜%, 1981 new money	4,000	101.25	3.56

SCHEDULED FOR FOLLOWING WEEK

Bonds—Appalachian Electric Power, 1st mtg, 1981 new money, $17 million; Cleveland Electric Illuminating, 1st mtg, 1986 new money, $25 million; Montana-Dakota Utilities, 1st mtg, serial 1952-71, acquisition of gas properties, $3 million.

Common Stock—United Utilities, Inc, 199,451 sh new money, $2 million.

Alabama Power Plans Million-Kw Barry Plant

A steam plant with ultimate capacity of one million kw will be built near Mobile by Alabama Power Co if the state Public Service Commission grants an application filed by the company last week.

The plant, to cost about $30 million, will have an initial capacity of 250,000 kw in two units designed to operate at 1,800 psi. First unit is expected to be in operation late in 1953 and the second in 1954, the company announced.

It will be located on a site owned by the company on the Mobile River 22 miles north of the city, and will be named for James M. Barry, company president.

•

C. L. Henson Reappointed

Commissioner Charles L. Henson has been reappointed to Missouri's Public Service Commission for the term expiring April 15, 1957. Henson, who was originally appointed to the commission in 1942 for an unexpired term and reappointed in 1945 for a full six-year term, is a member of the NARUC Committee on Progress in the Regulation of Public Utilities.

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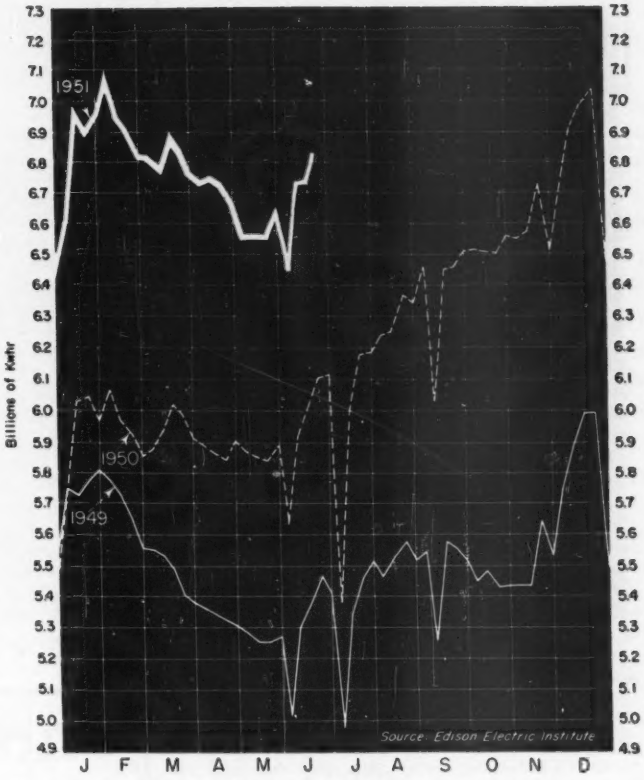
Installs Millionth Meter

Detroit Edison Co now has more than one million meters connected to its system. The company is installing an average of 125 meters a day and early last month installed their millionth meter.



Output Week Ended June 23—6,834,692,000 Kwhr

Weekly Output, Millions Kwhr

1951	1950	1949
June 23 6,835	June 24 6,102	June 25 5,466
June 16 6,747	June 17 6,012	June 18 5,373
June 9 6,734	June 10 5,921	June 11 5,300
June 2 6,445	June 3 5,632	June 4 5,018
May 26 6,653	May 27 5,894	May 28 5,270
May 19 6,559	May 20 5,845	May 21 5,255
May 12 6,567	May 13 5,864	May 14 5,527
May 5 6,560	May 6 5,868	May 7 5,284
Apr 28 6,674	Apr 29 5,902	Apr 30 5,304
Apr 21 6,730	Apr 22 5,846	Apr 23 5,326

Percent Change from Previous Year

	June 23	June 16	June 9
New England	+10.4	+12.7	+11.0
Mid-Atlantic	+11.2	+11.5	+12.6
Central Industrial	+10.3	+ 9.7	+11.3
West Central	+ 9.3	+ 8.1	+12.5
Southeast	+11.5	+14.0	+15.4
South Central	+16.6	+14.3	+24.6
Rocky Mountain	+14.9	+15.9	+14.9
Pacific Coast	+14.9	+15.1	+13.5
Total United States	+12.0	+12.2	+13.7

MEETINGS

★Electric Companies Advertising Program
Management Group Meeting, The Blackstone Hotel, Chicago, July 11.

American Institute of Electrical Engineers
Pacific General Meeting, Multnomah Hotel, Portland, Ore., August 20-23; Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

Pacific Electronic Exhibit
Civic Auditorium, San Francisco, August 22-24.

Illuminating Engineering Society
National Technical Conference, Hotel Shoreham, Washington, D. C., August 27-30.

Northern California Electrical Bureau
Annual Exposition, Civic Auditorium, San Francisco, September 1-9.

Rocky Mountain Electrical League
Fall Convention, La Fonda Hotel, Santa Fe, N. M., September 9-12.

★Pennsylvania Electric Association
Annual Meeting, Benjamin Franklin Hotel, Philadelphia, September 18-19; Joint Relay-Communications Committee Meeting, Emerson Hotel, Baltimore, Md., October 18-19.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, September 20-21.

American Society of Mechanical Engineers
Fall Meeting, Hotel Radisson, Minneapolis, Minn., September 25-28.

Iowa Utilities Association
Management Conference, Fort Des Mgines Hotel, Des Moines, Iowa, October 1-2.

International Association of Electrical Inspectors
Eastern Section, Chalfonte-Haddon Hall, Atlantic City, N. J., October 1-3.

★Southeastern Electric Exchange
Engineering-Operation Section Conference, John Marshall Hotel, Richmond, Va., October 4-5; Sales Conference, Roosevelt Hotel, New Orleans, La., October 31, November 1-2.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, October 9-10.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 10-12.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, October 10-13.

National Association of Railroad and Utilities Commissioners
Francis Marion Hotel, Charleston, S. C., October 16-19.

National Electronics Conference
Annual Conference, Edgewater Beach Hotel, Chicago, October 22-24.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

★Addition this week.

WASHINGTON COMMENT

Smart load forecasters are revising their earlier appraisals of a vital factor in future residential demand—the availability of appliances during the mobilization period. Revival of price controls, scarcities of materials and, finally, announcement of a new Controlled Materials Plan fooled a lot of people. It looked like the World War II situation all over again. That is, no more appliances for the "duration."

Washington's mobilizers, from Charles E. Wilson down, warned repeatedly that this would be a different kind of mobilization. It's apparent now they meant what they said. The big difference, this time, is there will be considerable raw materials for consumer goods, including radio and television sets, electric ranges, washers, refrigerators, and the like.

That's because the arms buildup has been scheduled to mount gradually, from the slow of last fall to a peak in late 1952, when weapons production is slated to be chewing up metals at its highest rate. At the same time, production of basic materials—steel, aluminum, and others—is being expanded rapidly, with and without government assistance. The result is enough materials for both weapons and allied production and a substantial level of consumer goods as far ahead as the mobilizers can see.

A Good Many 'Leftovers'

You get an idea of how much appliance production there'll be from the amounts of the so-called controlled metals of CMP—steel, copper, aluminum—the controllers figure will be left over for consumer durables during the third quarter of 1951. The amounts include 70% of the steel consumed in consumer hard goods in 1950—a record production year for most appliances. And there'll be 60% of the copper and 50% of the aluminum they used last year.

Metal use for appliances and other consumers items won't be cut much, if at all, during the fourth quarter. It probably will be reduced some next year, but not by much.

An even more significant factor, however, is the attitude of the appliance makers themselves. Back in April when the mobilizers announced CMP would go into effect this week, a number of industries sent representatives to Washington to plead for CMP allotments of materials. Washington has planned to allocate metal only for weapons and essential non-military production and services. But by the end of May, the controllers had agreed to put under CMP programming any industry that wanted it.

They Didn't Want 'In'

Apparently the appliance makers didn't want "in" under CMP. At least their Washington representatives didn't join the early clamoring for allotments. Several appliance men reported they were willing to take their chances on obtaining materials without government assistance.

In part, this attitude reflected the seasonal slump during the second quarter in consumer demand for most appliances and the more-than-seasonal drop in television sales. But it also was indicative of the outstanding ingenuity of the industry in coping with materials shortages and controls to date.

For example, television and radio producers were harder hit by shortages of such metals as cobalt and nickel than by those of steel, copper, and aluminum. When cobalt and nickel virtually disappeared, they went back to using copper coils in speakers. This was not practicable for smaller size and special receivers. But, though government controls prevented the production of more light alnico speaker magnets in this country, some manufacturers found—and bought—a supply of them in France.

Substitution for scarce materials already is an advanced art in the appliance production field, probably more advanced than in any other industry. That's why no one in Washington will try to predict the exact levels of appliance output in the months to come. On refrigerators, ranges, and most smaller appliances, the limiting factor will probably be steel, for which no suitable substitute is likely to be found. That would tend to keep output of these items at about 70% of the 1950 rate for the next six months, perhaps a little lower after Jan. 1.

For radio and television sets there is no obvious signpost. One additional restricting factor—besides materials and controls—is likely to be military demand for electronics equipment, which will take some radio and TV plant and labor. Such demands now are taking 12-15% of all electronics production. This demand will rise to about 25% by year's end.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Outage "reporters" have long been proposed as monitoring for farflung distribution; practicability is being approached in equipment under development.

Phase displacement of ultrasonic waves promises to afford a means for determining velocity and volume flow of large masses of water.

External combustors are being employed in Argentina to burn vegetable waste and municipal refuse for steam generation.

Rutile (titanium dioxide) is an excellent insulator if pure or until treated with hydrogen to remove some of the oxygen and leave an excess of titanium.

Revolving screens can be kept from icing by merely blowing warm air from the power house down the enclosed screen casing.

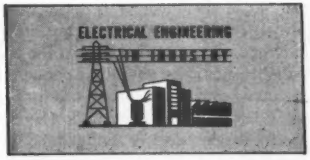
Sea water temperature differential of 68F at 1640 ft depth is the basis of a 7 Mw experimental generating project at Abidjan on the Ivory Coast. Circulating ducts of 8.2 ft are needed for the 353 cfs of cooling water at 46F.

Effluent from sewage treatment plants will first be used for condensing purposes in a West Coast power plant and then used for irrigation of nearby agricultural land.

ENTRANCE GATE requires proper lighting for examination of drivers' credentials, truck contents, etc, by guards

Industrial Protective Lighting Can Do Double Duty

Here are complete layout and wiring recommendations to help industrial and utility engineers solve protective outdoor lighting problems. Wise choice of equipment will insure continued use after present emergency is over



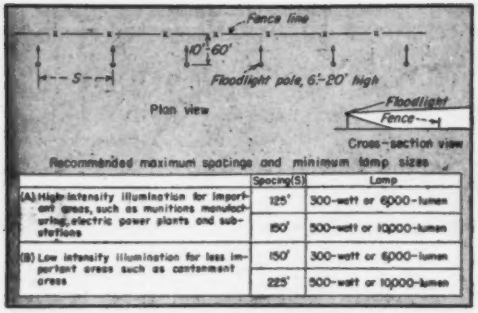
ALBERT H. CLARKE, Commercial Vice President, Illumination Dept, Crouse-Hinds Co, Syracuse, N. Y.

Under normal conditions when we think of outdoor floodlighting we think largely of light for sports and recreation. Under present conditions existing in the United States, which might be described as semi-mobilization, sports installations have practically come to a standstill. Part of this is due to definite prohibitions against certain types of construction and part due to a channeling of materials and labor into two classes of installations.

The first is the lighting of outdoor areas around industrial properties for safety and production. The second is the lighting of industrial and public utilities properties for protection against possible sabotage.

Sabotage is something that we must prepare for ahead of time. When and if a planned campaign of sabotage strikes, it would be too late because the accumulation of materials and their installation require a considerable time. If, as we sincerely hope, this emergency never strikes, these preparations will not be wasted because much of the lighting that is installed for protection of properties is also useful for production. It enables workers to move easily and safely around the plant and speeds handling of materials. For this reason it is well to keep in mind when selecting lighting equipment that some of it will be available after the emergency for such use as lighting employees' athletic fields and a wise original choice of equipment will insure its continued economical use.

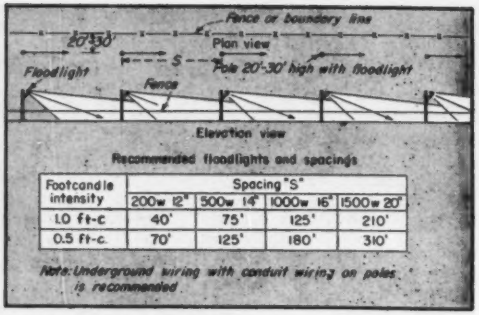
Glare Lighting . . . This is the system recommended for long sections of fence such as are found around isolated prop-



Recommended maximum spacings and minimum lamp sizes

	Spacing (S)	Lamp
(A) High intensity illumination for important areas, such as munitions manufacturing, electric power plants and substations	125'	300-watt or 6000-lumen
	150'	500-watt or 10000-lumen
(B) Low intensity illumination for less important areas such as containment areas	150'	300-watt or 6000-lumen
	225'	500-watt or 10000-lumen

GLARE LIGHTING is recommended for long sections of fence around isolated properties where floodlight poles can be placed fairly close to fence. Fresnel lens floodlights mounted on low poles directed toward fence produce glare

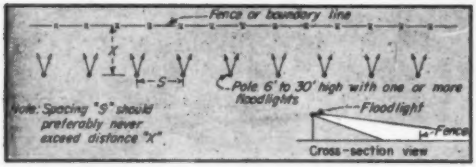


Recommended floodlights and spacings

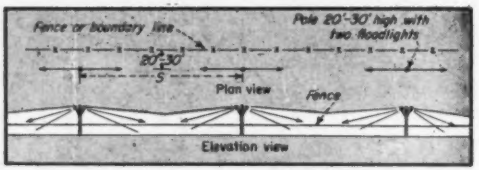
Footcandle intensity	Spacing "S"			
	200w 12"	500w 14"	1000w 16"	1500w 20"
1.0 ft-c	40'	75'	125'	210'
0.5 ft-c	70'	125'	180'	310'

Note: Underground wiring with conduit wiring on poles is recommended.

PATROL ROAD fence lighting using standard enclosed long range floodlights with plain lenses. Floodlights are aimed in direction of watchman's travel. System cannot be used unless watchman patrols in one direction only



FENCE LIGHTING where it is desired to light a wider strip in back of fence. Standard enclosed type floodlights with 100-deg horizontal spread lens are used. Units are mounted further back from fence due to their narrow beams and are usually wired on multiple system



FENCE LINE lighting where watchman observes from some distance in back of floodlight locations. Standard enclosed long range floodlights with plain lens are used. It is more economical than arrangement shown at left, since fewer poles are required

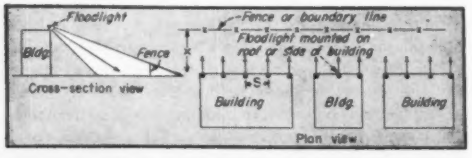
erties which cover large areas. These fence lines may be located a considerable distance from any building. The floodlights are mounted on low poles and are directed toward the fence so that they produce glare in the eyes of an intruder but provide good lighting for a guard located in a dark area behind the lights. Due to the very long fence line and sometimes temporary character of the installation a special series floodlight is recommended. The use of series wiring results in the lowest possible installation cost since only one wire is carried around the property.

Floodlights should be placed far enough behind fence to cause a double overlap of floodlight beam patterns so that failure of a lamp will not leave dark a section of fence.

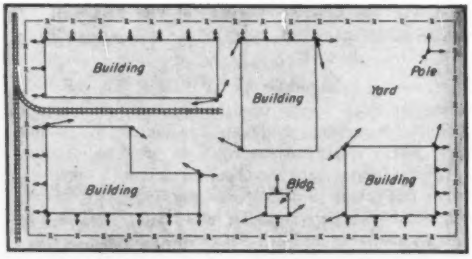
Mounting height used for each installation will depend upon results desired and contours of ground. Where ground is level, a low mounting height is usually desirable for producing maximum glare to an intruder and best visibility to a watchman.

Distance between poles and fence for each installation will depend largely upon space available and the results desired, principally whether it is desired to light a strip more on the inside or more on the outside of the fence line.

Wiring . . . Two entirely different wiring systems are used for large protective lighting installations. If the fence line is very long and the units are mounted on poles along it, a series installation is sometimes the cheapest. This is the same type of wiring as is used in street lighting. It involves the use of high voltages and of constant current regulating transformers. Individual lamp burn-outs do not affect the system because each lamp socket is provided with a series



BUILDING MOUNTED floodlights for fence lighting using standard enclosed type units with 100 deg spread lenses result in economical installation with connections to interior wiring system. Protective lighting should be tied into a central control by time clocks or photoelectric controls



YARD AND FENCE lighting with standard enclosed floodlights mostly located on factory buildings. For yard lighting, plain lenses, 50 deg spread lenses, 100 deg spread lenses, or diffusing lenses are used. Yard areas should be lighted from at least two directions to eliminate shadows

FREIGHT YARDS need high level shadowless light to aid operations and protect against intruders and sabotage. Light should be directed *with* the tracks rather than *across* them

MATERIALS HANDLING and freight car loading and unloading is speeded by well distributed light. It is important that there be no dark shadows which could conceal an intruder

film cut-out which punctures and shorts out that particular lamp socket thus completing the circuit to the remainder of the lights. The principal disadvantage of a series system for an industrial installation is that most industrial electricians are not familiar with series circuits and prefer not to handle the high voltages and special regulating equipment involved. It is recommended that a photoelectric control be used to turn the system on and off as this takes care of dark stormy days when the lights should be turned on earlier than on clear days.

The more familiar multiple wiring system, while more expensive to install initially, has the advantage that the same power can be used to operate other equipment. It is also sometimes possible to use available building circuits. Here again the photoelectric control is recommended.

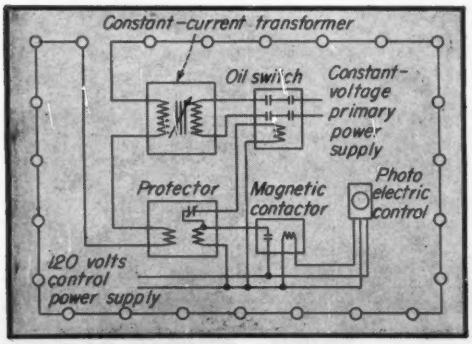
If the lighting equipment is installed on poles where it might be accessible for tampering, the wiring should be underground to the poles and should be run up the poles in conduit in order to make it difficult for anyone to cut the wires.

The control can be accomplished with time clocks provided they are of the astronomical dial type which automatically compensates for the change in the length of the day. This, however, does not take care of dark stormy days as does the photoelectric control. If there is liable to be need for blackout control, all circuits should be controlled from one common point.

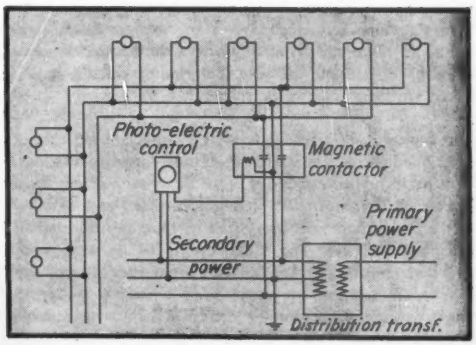
Voltage . . . The wiring system should be designed to maintain the voltage within 2% of that for which the lamps are rated. When the circuit voltage exceeds the lamp

IES Recommended Average Minimum Footcandle Values for Protective Lighting of Industrial Outdoor Areas

Location	Footcandles On Horizontal
Fence Lighting	0.15 to 0.20
Entrances, authorized	1.00 to 2.00
Entrances, unauthorized	0.15 to 0.20
Vulnerable Location	0.20
Water Fronts	0.20
General Area Lighting	0.1 to 1.0
Shipping platforms	2.0
Walk paths	0.15



SERIES DISTRIBUTION to a very long fence lighting system is sometimes cheapest. Lamp performance is uniform and individual lamp burn-outs do not affect system



MULTIPLE DISTRIBUTION has advantage that some power can be used to operate other equipment; available building circuits and standard equipment are used

FACTORY YARD areas including substation, coal storage piles, railroad tracks, equipment, etc, need high level lighting for operations as well as for protective purposes

CAR PARKING LOTS require good lighting to minimize pilferage or tampering with cars. Since parking lots are often outside main plant areas, need for proper lighting is increased

voltage, lamp life is shortened considerably and the light output of the lamp increases rapidly. This condition could be used advantageously where installations are only operated for a few hundred hours per year. It results in the use of less equipment and a lower over-all cost even though the lamp cost is higher.

When a lamp is operated considerably under its rated voltage, life increases many times but the light output drops considerably. This condition can only be used advantageously when lighting units are installed in locations which make them very difficult and expensive to relamp such as obstruction lights on television towers. In this case it pays to install larger lamps to take care of the drop in light output and deliberately operate them under voltage to obtain long life.

Maintenance . . . In protective lighting installations maintenance is especially important. All burned out lamps must be replaced very promptly. Some users have a plan to replace all lamps when they have operated for a certain number of hours. Cleaning of the units, especially the outside of the lenses, should be done at least every time the unit is relamped and under some unusually dirty conditions at more frequent intervals. Disconnecting hangers which allow the units to be lowered to the ground for relamping and servicing save many maintenance manhours. If these are located where unauthorized persons would have access to the pole the relamping chain can be locked so that it cannot be released.

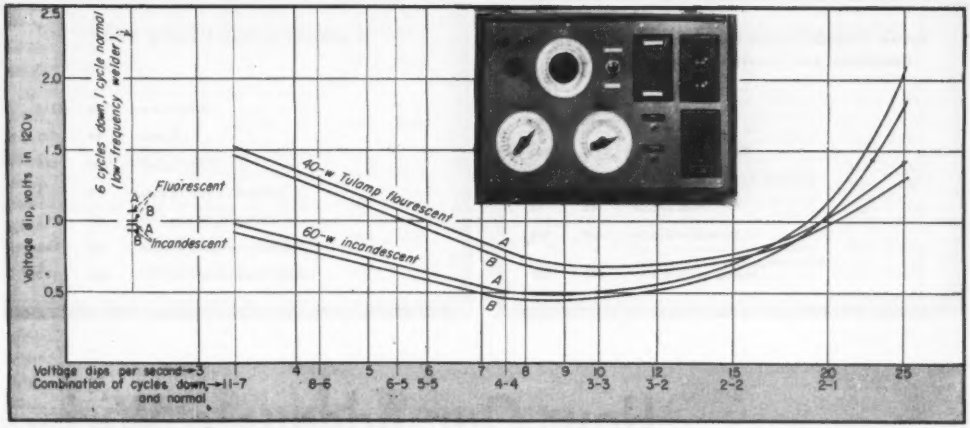
Searchlights . . . Searchlights are an important element of protective lighting and are used on most large installations. They perform two functions. One is to supplement fixed lighting system to provide increased intensity and visibility for the watchman who may wish to spot any unusual or suspicious activity. The other use is as an emergency source of lighting. Since the searchlight uses a comparatively small amount of power, it is a simple matter to provide an auxiliary gasoline driven generator or storage batteries. If the regular source of power is interrupted, these searchlights form an invaluable source of emergency lighting. One favorite lamp used for this purpose is 420-w, 12-v. This particular lamp can be operated for approximately 2 hr from two standard automobile storage batteries in series.

Railroads . . . Our railroads as one of our most vital means of transportation are especially important from a protection standpoint. Due to the cost of railroad yards they are operated 24 hr a day. Light here is important for proper operation in order to save time and also to prevent damage to the contents of cars. Damaging collisions may occur if the operators cannot at all times judge the distance which a car has to travel in order to properly couple with the other cars on its tracks. Of course, the problems of protection and detection of intruders are very important and here again the necessity of elimination of shadows must be given careful study. Due to the size of most of these yards it is necessary to direct light *with* the tracks rather than *across* them and if the lighting is properly designed the silhouette effect can assist visibility rather than hinder it.

High-Lighted All Over

Sylvania Electric Products, Inc, photo

WARMTONE FLUORESCENT LAMPS emphasize the greens and yellows of fruits and vegetables on display in the Cherokee Supermarket in St. Louis. Average intensity of 90 ft-c is stepped up to 125 on the meat cases by incandescent spotlights



CYCLIC FLICKER was just perceptible to 50% of the 20 observers at points represented by curves A, and by 40% of observers at points represented by curves B. Flicker generator (photo) was built with standard electronic components. All the various combinations of cycles, and the amount of voltage dip, can be obtained by simple and easy adjustment

Flicker Level Guides Distribution Design

WILLIAM A. LINDBERG, Senior Engineer, System Planning Division
Commonwealth Edison Co, Chicago, Ill.

Lamp flicker produced by interrupted-seam welder operation has been simulated to provide distribution engineers with data for planning service to such welders. Cyclic voltage dips were produced for test purposes by electronic apparatus designed by W. Kiefer and associates in the Company's testing department.

It was found that one out of two persons noticed the flicker of 60-w incandescent lamps that had been subjected to abrupt 0.5-v cyclic dips produced at from 7.5 to 10 dips per second. The cyclic frequency combination used, on a 60-cycle system, was three or four cycles with reduced voltage followed by three or four cycles normal voltage.

With fluorescent lamps, the observable mean minimum dip was 0.7 v. This was for a combination of three cycles low and three cycles normal voltage, then three cycles low and two cycles normal voltage. Other combinations of cycles, and the voltage dip at which flicker was perceived, are shown on the accompanying graph.

Flicker Generator . . . The electronic "flicker generator" introduces a counter voltage, through a coupling transformer to the lines running to the test lamps. Voltage dips are adjustable from 0.4 to 6.4 v. Period of the voltage dips, as well as time between dips, may be controlled between one and 28 cycles in steps of one cycle. Single dips of one or more cycles also can be produced. A booster transformer compensates for the constant voltage drop in the flicker generator.

The voltage dial was calibrated with a specially modified indicating meter having several scale divisions of about ¼ in. per volt near the 118-v level. This calibration is affected by changes in the lamp load or impedance changes in the 120-v circuit to the flicker generator.

Conducting the Tests . . . Tests were conducted in a small office which contained ceiling mounted fixtures. Ten 60-w incandescent lamps or twelve 40-w tulamp fluorescent tubes were used, all shielded. Light intensities at desk level averaged 15 ft-c for the incandescent lamps, 35 ft-c for the fluorescent.

The range of combinations of cycles for welder load "on" and "off" as used during the tests was that likely to be found in practice. For the tests, each subject was seated at a desk and told to look at a sheet of white paper in front of him. While the operator increased the cyclic voltage dip in small steps at intervals of about ten seconds, the twenty subjects recorded the voltage drop (given in code by the operator) at which the lamp flicker was first definitely noticeable. This was repeated for each selected combination of cycles with both incandescent and fluorescent lamps.

Design Values . . . Since it is not economical—or even necessary—to design for the individual with the most sensitive eyes, design values may be established by rejecting a chosen percent of the lower readings. This is illustrated in the graph: The curves were drawn so that the lower 40% and lower 50% of the points for incandescent and fluorescent lamps, respectively, are below the lines.

In fixing points for the graph, it was assumed that a group of observations at one voltage would be distributed uniformly between that voltage and the next lower voltage step used. Results with the illumination reduced about 50% were found to be practically the same.

Special Purpose Circuits Recommended for Individual Residences and Apartment House Construction

	1949	1950
Range Circuits	2836	2381
Water Heater Circuits	2451	1862
Automatic Cycle Washer Circuits	90	108
Dryer Circuits	83	76
Dishwasher Circuits	469	342
Misc. such as circuits for bathroom heaters, attic fans, etc.	845	578

Appliances Delivered During Year

	1949	1950
Refrigerators	1348	2215
Ranges	69	131
Water Heaters	208	385
Automatic Cycle Washers	7	4
Kitchen Ventilating Fans	48	295
Built-in Bathroom Space Heaters	50	248
Roaster Ovens, Attic Fans, etc.	110	113

How Our Adequate Wiring

M. T. REEVES, Div. Adequate Wiring Representative
Georgia Power Co, Atlanta, Ga.

Our program of Adequate Wiring and New Home Sales Promotion has produced very profitable results. The estimated annual revenue from this activity was $45,284 in 1949 and $66,617 in 1950. Adequate wiring or major improvements over and above minimum code requirements resulted in 911 of the 6,400 single family homes built in the Greater Atlanta Area in 1949 and 1036 of the 8060 homes built in 1950. Approximately 1840 major appliances were delivered in 1949 and 3392 in 1950 as a result of this activity.

The territory over which this work is concentrated is in the Greater Atlanta area comprising about 2½ counties, and there are two full-time employees and one part-time employee engaged in the activity. In 1949 a total of 10,200 dwelling units were completed, of which 3,800 were multiple-unit apartment type and 6,400 were single family units built for sale or for owner occupancy. In 1950 a total of 11,900 dwelling units were completed of which 3840 were multiple-unit apartment type and 8060 were single family units built for sale or owner occupancy.

The object of our work is a load building activity although it necessarily ties in and results in a proportionate increase in appliance sales. Most of the appliance sales are made by local distributors and dealers.

During the course of our adequate wiring contacts, special purpose circuits were recommended for appliances in individual residence and apartment house construction. Using the word "recommended" may be rather conservative, since we used all the sales appeal known to us. Our batting average was not 100%, as you can see from the accompanying tables, but at any rate we tried to sell by direct contact.

Breakdown of Wiring Installed in Houses Adequately Wired

	1949	1950
Number of houses included	87	100
Ceiling Lighting Outlets	1554	1853
Wall Lighting Outlets	535	686
Switch outlets	2093	2804
Convenience outlets (duplex)	2984	3689
15 amp circuits	565	693
20 amp circuits	253	319
Range circuits	95	119
Water heater circuits	39	16
Dishwasher circuits	9	33
Washer circuits	28	51
Dryer circuits	9	21
Kitchen fan circuits	20	32
Attic fan circuits	14	17
Having 3 #6 service entrance wire	19	38
Having 3 #4 service entrance wire	59	55
Having 3 #2 service entrance wire	9	18
Having 60 amp main switch panel	37	43
Having 100 amp main switch panel	48	69
Having 200 amp main switch panel	2	1

The results of our activities are shown in the accompanying tables which reflect accomplishments possible for the type of construction. First is the promotion of appliance sales in apartment house developments and water heater sales in apartment and speculative developments. In Georgia it is possible to sell under the same mortgage loan (applies to FHA Title 608 loans only) all major appliances in apartment house developments, but the so called "package mortgage" in single family residence has just been authorized by F.H.A. permitting the same facilities in private homes.

In single family owner-occupant and speculative developments our efforts are devoted mainly to the promotion of certified Adequate Wiring or at least to improving the overall standard of wiring in each residence, getting adequate service entrance wires installed to carry any present or future major appliance load, and to get special circuits for range, dishwasher, water heater, washer, dryer, ironer, etc, installed.

For speculative builders, our plan of operation was as follows:

1. Maintain membership and take active part in local Home Builders Association.

2. Direct contact offering free planning service on wiring, kitchens, and laundry, and promoting certified wiring as a sales help to them.

3. Participate in annual home show sponsored by builders, where approxi-

Services Performed for Owner-Occupant Builders

	1949	1950
Letters mailed with adequate wiring info, kitchen and laundry planning to all persons applying for a building permit	2021	1175
Pieces of literature delivered as handout pieces at home shows, etc.	6559	10,286
Adequate wiring house plans drawn and delivered	114	147
Kitchen plans drawn and furnished	154	187
Laundry plans drawn and furnished	29	40

Wiring Improvements Resulting from Activities

	1949	1950
House adequately wired to Georgia Adequate Wiring Bureau Standards	87	100
Houses wired with Range and Water Heater Circuits plus good wiring otherwise, but short of A. W. standards in some minor detail	104	230
Houses wired with Range Circuits but short of A. W. standards in minor details	481	432
Houses with Water Heater Circuits	149	237
Houses with 60 amp or larger service entrance capacity	90	37
Total houses with Adequate Wiring or major improvements over and above minimum code requirements	911	1,036
Percentage of houses having wiring improvements of those built	14.23	12.80

Program Builds Revenue

mately 35,000 people visited our booth (1951), demonstrating wiring, and the latest models of electrical appliances.

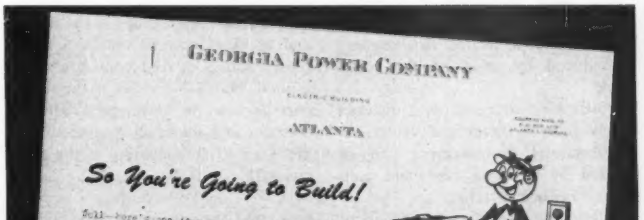
4. In cooperation with Westinghouse Mfg. Company, four all-electric houses were built, furnished, advertised, and demonstrated to the public for 10 days during National Home Week. From the public acceptance and enthusiasm, many builders realized the sales appeal of an adequately wired and all-electric home, and requested our planning help as a result.

5. Since table top electric water heaters have certain natural advantages in small homes with no basement, their use has been pushed among builders, and many of them have switched to this method as a result.

6. Monthly mailing of "Electricity in Building" to selected builders.

For architects and home plan designers direct contact is made offering to assist them in preparing the electrical layout and kitchen plan. Many architects regularly call on us for these services.

All electrical contractors and inspectors were invited to a meeting where the Certified Adequate Wiring program was explained, especially as benefits the contractor. They were asked to jointly sponsor and promote the certification program with us. They accepted our request and a fair proportion of them have been actively promoting it since. We have conducted several educational meetings with them and find that new ones are joining in the movement. We believe this is a step in the most effective way to promote Adequate Wiring and expect to continue its development as far as possible. Monthly issues of "Electricity in Building" and "The Adequate Wiring Reporter" magazines are mailed to these contractors.


GEORGIA POWER COMPANY

ATLANTA

So You're Going to Build!

LETTER MAILED with adequate wiring info to all persons applying for a building permit offers adequate wiring planning services of the utility company

In 1949 there were 87 houses which met certification standards. Out of this number the electrical contractors cooperating with our A.W. program were responsible for 39. A breakdown of the wiring installed in these 87 houses indicates that they were far above the average, and that many electrical appliances will be sold to the owners. A breakdown study of these 87 houses is shown in the table.

For the purpose of easy and compact comprehension of the total results for 1949, we have included a chart which has been divided into appliance sales results in apartments and speculative developments, and in wiring results in single family construction. Also indicated is the proposition on the natural gas rates prevailing and the fact that many building operators are required to specify gas appliances in order to get gas heating without excessive installation costs.

Acoustic Panels, Core and Coil Isolation

Sound absorption properties of acoustic panels with resonant cavity (Helmholtz resonator) investigated. Isolation of small transformer core and coils shows noise level reduction

ARMAND V. LAMBERT, Engineering Dept.
Portland General Electric Co, Portland Ore.

Investigation by Portland General Electric of transformer noise distribution, various types of sound barriers, and the effect of modifications of internal structure indicate that:

1. Acoustic panels built with a resonant cavity to form an acoustic filter (Helmholtz resonator) promise good results with minimum interference with ventilation.
2. Noise level at nearest dwelling can be reduced by orienting the transformer.
3. Noise level decrease with distance closely follows theoretical values.
4. Substantial improvement can be realized by isolating core and coils from transformer tank.

Solution of the general problem of objectionable transformer noise must be predicated on establishment in the affected area of a non-objectionable noise level based on predetermined standards. Results of investigations also indicate that a combination of ambient noise level and harmonic index can serve as a guide in determining whether a transformer installation will meet these predetermined noise standards based on past experience.

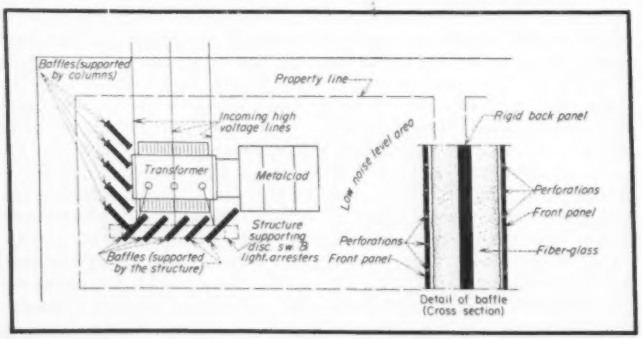
In the present state of the art two characteristics of a noise can be measured: total noise level and frequency spectrum. Noise level is measured and expressed in decibels. Frequency spectrum must be traced by a frequency analyzer and cannot be as easily represented. For the utility engineer the harmonic index is the easiest and quickest way to obtain a figure representative of frequency content of a noise. Harmonic index is the difference between the unweighted db measurement and the level measured with the A or 40 db weighting of the noise meter (h_i = db flat − db_{40}).

Suggested Procedure . . . The following procedure is suggested to determine the non-objectionable noise level for a proposed site. Noise level in db and harmonic index should be taken at night, far enough away from the site that the transformer hum is not audible. These two values can be considered as representative of a non-objectionable or ambient level.

It is almost certain that with present means the noise produced by a transformer could not be reduced so the total noise level and harmonic index measured at the substation fence would match these readings. However, they can serve as a reference. Usually the distance between transformer and nearest dwelling is known. Using the predetermined non-objectionable noise level, the corresponding noise level around the transformer can be determined by the accompanying chart of noise level reduction as a function of distance from the unit.

This chart resulted from field data taken for a three-phase, 3,000 kva, 57/12 kv transformer remote from all buildings that could reflect sound. The suggested curve is a composite of curves representing decrease in noise level as a function of distance, traced for different vertical planes and elevations. Since the distance from transformer to nearest dwelling is usually known, the curve will show whether a transformer with a given noise level will create an arbitrary objectionable noise level at the dwelling—or conversely, knowing the non-objectionable noise level at the dwelling, the chart will determine the allowable noise level at the transformer. Decision between using a quieter transformer or building some type of sound barrier if this level is too high will still depend on relative costs, of course.

The same field tests showed that noise level at the nearest dwelling could be reduced by orienting the transformer. Equal noise level curves show that the radiators, for instance, have a definite damping effect on noise. Substations should be carefully laid out to take advantage of this noise absorbing effect of radiators or metal-clad switchgear.



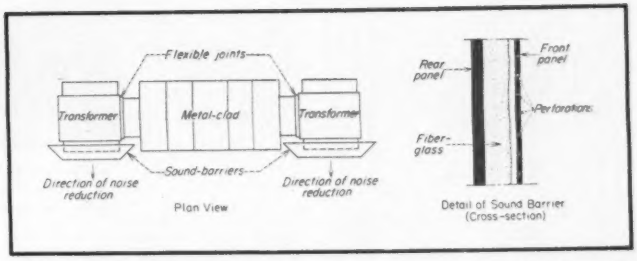
UNUSUAL APPROACH to transformer noise problem are these acoustic panels with resonant cavity (Helmholtz resonator) which absorb sound energy as it leaves the transformer. Baffle arrangement gives minimum interference to ventilation

Resonator Principle . . . Portland General Electric, like other utilities, has investigated a number of types of sound barriers. One unusual type considered is a sound absorbing structure using the Helmholtz resonator principle. Such a structure is composed of a perforated transite front panel and a solid impervious back panel, separated by an air space. Perforations in the front panel can be round holes or

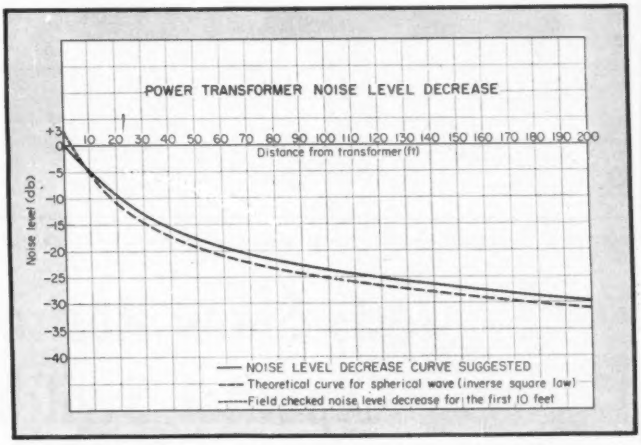
Promise Noise Relief

slots. Dimensions of the perforations, their spacing, thickness of the front panel, and air space between front and back panels are all variables that determine the frequency of resonance of the structure for which the sound absorption is maximum. This absorption can be broadened over a wider range of frequencies by filling the air space with porous material such as fiberglass or rock wool. This type of structure thus combines the absorptive qualities of such porous materials with that of the structure itself in protecting the porous materials against weather conditions. Such structures can be designed to work as acoustical filters for specific frequencies. They are thus well suited for this application since the predominant frequencies of transformer noise can be measured.

Other methods investigated for reducing noice around a transformer include partial barriers to reduce noise in one or two directions, enclosures, roofed or not, mounting transformer on resilient pads, and connecting metal-clad switchgear to the transformer with resilient joints.



ANOTHER APPROACH using resonant cavity is a partial sound barrier built close to side where noise reduction is desired. Size and spacing of perforations, thickness and spacing of front panel provide desired resonant frequency



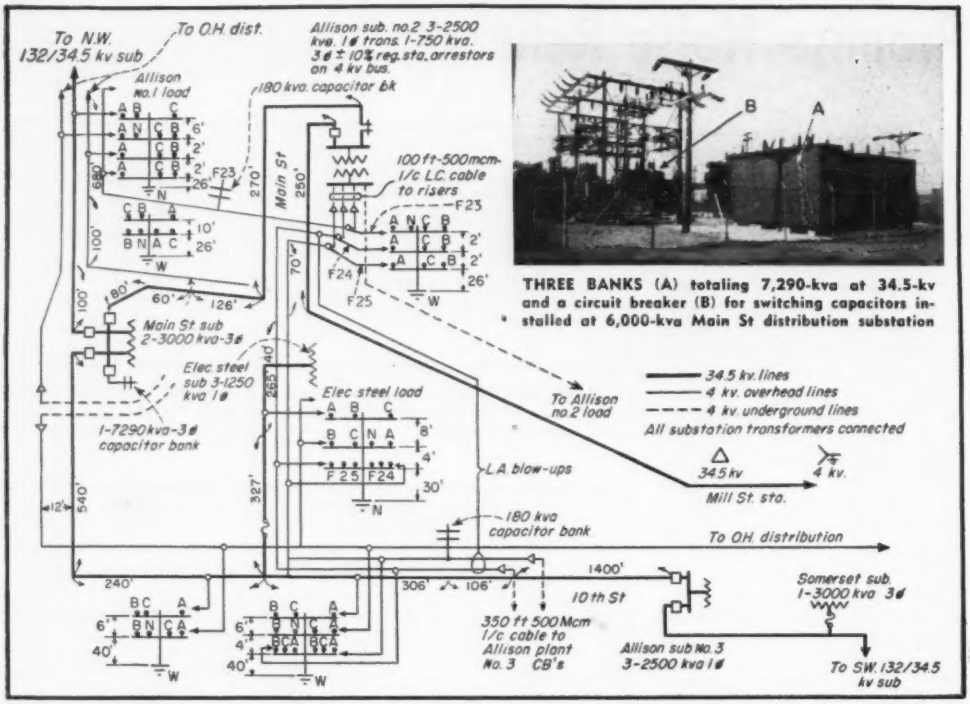
NOISE LEVEL REDUCTION as function of distance given by this curve enables Portland General Electric to predict levels at house nearest transformer installation. Curve is composite resulting from field data taken for typical 3,000 kva unit

Internal Modification . . . In an attempt to determine the potential value of isolating core from tank and of interposing a sound barrier between core and tank wall, PGE made a series of tests on a small transformer. Results indicate that a substantial improvement can thus be realized.

The tests were performed with a 15-kva distribution-type transformer core and an oil drum. Noise levels and frequency spectra were measured both with and without oil in the tank for the core resting on the tank bottom, resting on resilient pads of two different types, and suspended from the top. Conclusions were that isolating the core definitely reduced the noise level; that sound-absorbing liner, such as felt, would have to be mounted outside the tank and be used in thicknesses of at least 4 in. to be effective; that damping effect of oil was most pronounced for the higher frequencies; and that four small resilient pads supporting the core gave better damping than one large one. Damping effect of the oil was particularly apparent on higher frequencies, although similar tests performed by manufacturers indicate that oil has no damping effect at all.

The analogy between mediums of different acoustical impedances such as oil-air, and two circuits of different impedance, indicate that oil should have some damping effect, at least on high frequencies since sound energy transmitted from oil to air would be small. Although total noise level measured near the transformer would not show any decrease, the transformer would "sound" quieter at a given distance because of the absence of high frequencies in the noise spectrum. This phenomenon results from the non-linear response characteristics of the human ear.

Recent tests performed on a 3,000 kva, 57/12.5 kv transformer indicated a noise level reduction of 8 to 9 db obtained by resting the core and coil assembly on resilient pads and mounting a very simple barrier between the core and the tank walls. It is not anticipated that this method will be successful on all transformers. Noise may be reduced at the source by using lower core flux densities or other internal means, or may be reduced at the point of complaint by sound barriers outside the transformer.


To N.W. 132/34.5 kv sub
To O.H. dist.
Allison sub. no.2 3-2500 kva. 1ø trans. 1-750 kva. 3ø ± 10% reg. sta. arrestors on 4 kv bus.
Allison no.1 load
180 kva. capacitor bk
100 ft-500mcm-1/c L.C. cable to risers
Main St
Main St sub 2-3000 kva-3ø
Elec. steel sub 3-1250 kva 1ø
Elec. steel load
1-7290 kva-3ø capacitor bank
To Allison no.2 load
34.5 kv. lines
4 kv. overhead lines
4 kv. underground lines
All substation transformers connected
34.5 kv
4 kv.
Mill St. sta.
L.A. blow-ups
180 kva capacitor bank
To O.H. distribution
10th St
Somerset sub. 1-3000 kva 3ø
350 ft 500 Mcm 1/c cable to Allison plant No. 3 CB's
Allison sub No. 3 3-2500 kva 1ø
To SW. 132/34.5 kv sub
B
A

THREE BANKS (A) totaling 7,290-kva at 34.5-kv and a circuit breaker (B) for switching capacitors installed at 6,000-kva Main St distribution substation

INDUSTRIAL SUBSTATIONS and Main St general distribution substation of the Indianapolis Power & Light Co

Tests Show Restrikes In Capacitor Switching

Based on findings, interrupter is developed to overcome special problems of surges on inductively coupled circuits

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Indianapolis Power & Light Company, Indianapolis, Ind.
and
R. C. VAN SICKLE, Advisory Engineer, Power Circuit Breaker Engineering
Westinghouse Electric Corp, East Pittsburgh, Pa.

In installing one of the first 34.5-kv capacitor banks in this country, the Indianapolis Power & Light Co encountered a number of unusual problems. First was the problem of restrikes when switching to de-energize the capacitor bank. Study of this problem showed that voltage surges caused by capacitor restrikes at one voltage level can set up relatively greater oscillations at another voltage level when conditions of coupling and circuit constants are favorable. The need, then, was for an interrupter that would perform the severe duty of capacitor switching in a manner that would minimize restrikes. The tests led to development of an interrupter.

Install 34.5-kv Bank . . . In May of 1949, three housed, three-phase capacitor banks totaling 7,290 kva at 34.5 kv and a standard 34.5-kv circuit breaker for capacitor switching were installed at the company's 6,000 kva, 34.5/4.3-kv, Main St general distribution substation. This substation is very close geographically and electrically to three industrial substations totaling 18,750 kva in capacity.

Each bank is made up of 162, 15-kva 6.65-kv individually-fused capacitor units connected ungrounded wye, each phase consisting of three groups of 18 paralleled units connected in series. The neutral of one bank is connected to the neutral of each of the other two banks through a 6,000/120-v potential transformer (34.5-kv insulation). A voltage relay is connected to the secondary of each poten-

tial transformer and is set to trip the capacitor breaker when 4-v unbalance appears on the potential transformer secondary. With perfectly matched capacitor units, one unit out in a group will impress 2-v unbalance on the voltage relay and 4.5% overvoltage on the remaining units in the group, while two units out in a group will impress 5.2-v unbalance on the voltage relay and 9.5% overvoltage on the remaining units in a group. Since capacitor units are designed to operate at no more than 5% average overvoltage in a 24 hr period, the reason for the 4-v setting of the relay becomes apparent.

Standard Breaker Tests . . . It was anticipated that the use of the standard breaker would result in some restrikes upon de-energizing the bank, but since recorded experience with larger banks at 15 kv indicated voltage swings to magnitudes of less than 2½ times normal, it was decided to try the standard breaker and allow the station arresters to protect the substation equipment from any overvoltages that might occur.

First tests were made with a nine-element magnetic oscillograph to record the currents and phase-to-ground voltages on the bus side of the capacitor breaker and the phase-to-ground voltages on the capacitor side of the capacitor breaker. There were 11 energizing and de-energizing operations while the industrial load was on. System impedance at the Main St 34.5-kv bus was approximately 19% on a 100,000-kva base. During the first five energizing and de-energizing operations there were no system disturbances involving damage to system equipment.

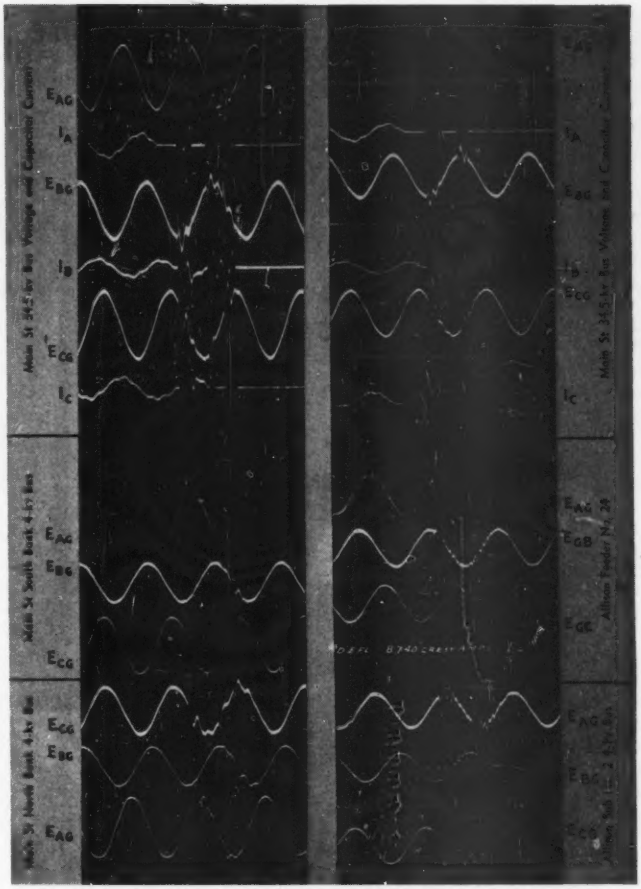


FIG 1—OSCILLATIONS at different voltage levels were nearly equal during this test with the standard breaker

FIG 2—VOLTAGE SURGES due to capacitor restrike at one voltage set up oscillations at another level.

Energizing operations . . . Inrush currents of approximately 660 cycles per second lasting ½ to ¾ cycle of fundamental 60-cycle frequency characterized the energizing operations. There was no significant overvoltage apparent from the oscillograms. Each de-energizing operation was accompanied by one to three restrikes with 34.5-kv bus voltages up to 2.35 times normal apparent from the oscillograms.

On the following day, two energizing and de-energizing operations were made. Oscillograms were taken only on the de-energizing operations on this and following tests since the energizing operations did not appear to be probable sources of trouble. There was no system disturbance involving damage to system equipment on the first de-energizing operation. The oscillogram indicated one single-phase and one two-phase restrike with a maximum voltage 1.8 times normal.

On the second de-energizing operation a 3-kv valve type line arrester was blown up on the C phase of the 4-kv grounded neutral circuit, F24, at a riser pole just outside Allison No. 2 substation. This caused the power fuse on this phase to blow at the substation, while the arcing accompanying the arrester damage caused two power fuses to blow on the 4-kv circuit, F23, directly above and on the same pole.

Two re-ignitions of one phase followed by a restrike between the two 34.5-kv phases corresponding to the 4-kv phase to ground voltage on which the lightning arrester was blown up (a restrike being defined as the re-establishment of current after a current pause of more than ¼ cycle). As nearly as could be determined from the oscillogram, the maximum voltage on the 34.5-kv bus was 1.87 times normal. No record was made of the voltages at 4 kv.

A week later, five de-energizing operations were made (See Table).

On the Tests No. 16 and 18 (see

Table), the capacitor current elements of the oscillograph were reconnected to the 4-kv bus phase-to-ground voltages at Main St substation. There was no apparent difference in oscillation frequencies of the 34.5-kv and 4-kv bus voltages.

On Test No. 20, the capacitor voltage elements of the oscillograph were reconnected to the 4-kv bus phase-to-ground voltages at Allison Sub No. 2. The oscillogram indicated that the Allison Sub No. 2, 4-kv bus voltage oscillations were of a higher frequency and were sustained for a longer time than the 34.5-kv voltage oscillations. The maximum 4-kv bus voltage shown by the oscillogram was 2.7 times normal on C phase.

Another Series . . . Twenty-two de-energizing operations of another series was made later to obtain comparative magnitudes and frequencies of voltage oscillations at the Main St 34.5-kv bus, Main St 4-kv bus, Allison Sub No. 2 4-kv bus, and the F24 4-kv feeder riser just outside Allison Sub No. 2.

Two nine-element magnetic oscillographs were placed in the control house at Main St substation, and overhead control cable was installed for a distance of approximately 320 ft from Allison Sub No. 2 in order to record 4-kv voltages and neutral current at the latter location. Oscillograms were made on the first 21 of these operations.

Few Restrikes . . .Six of the 21 operations were free from re-ignitions or restrikes. During the first 9 of these operations the system impedance at the main St 34-5-kv bus was 26% on 100,000-kva base because one of the

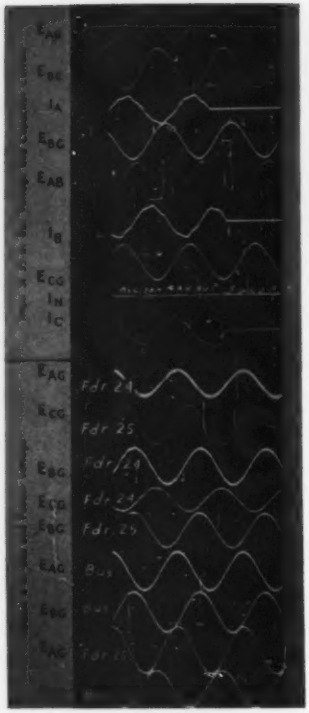


FIG 3—DE-ENERGIZING TEST with modified breaker. Of 22 tests, 20 were without restrike or re-ignition

34.5-kv lines was open at Allison Sub No. 3 for maintenance work. During the remaining 13 operations the 34.5-kv line was closed and the system impedance was 19%. There were no system disturbances involving damage to system equipment during this series of tests.

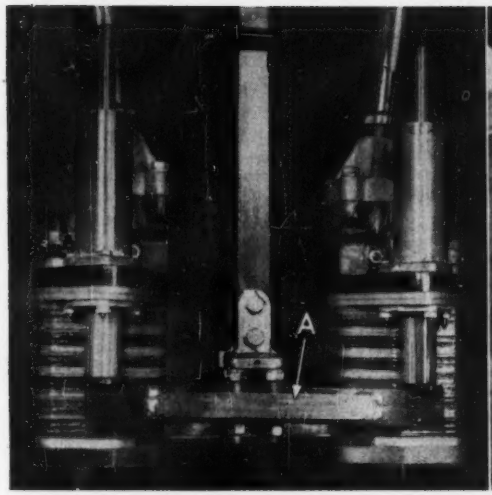
As shown by the oscillogram of Fig 1, the voltage oscillation frequencies at the two 4-kv buses at Main St Sub were substantially the same as that of the Main St 34.5-kv bus voltage, approximately 480 cycles per second. On the other hand, the oscillogram of Fig. 2 indicates that the voltage oscillation frequencies of the Allison Sub No. 2 4-kv bus and F24 riser were of the order of 1,130 cycles compared to 660 cycles for the 34.5-kv bus at Main St substation. While phase-to-ground voltages at the Main St 34.5-kv and 4-kv buses did not exceed 2.06 times normal, voltages at the Allison Sub No 2 4-kv bus went as high as 2.75 times normal. Although there was no damage to system equipment in this series of tests, it is apparent that a driving voltage surge due to capacitor restrike at one voltage level can set up relatively greater voltage oscillations at another voltage level under favorable conditions of coupling and circuit constants.

Interrupter Requirements . . . Interrupters were studied to determine whether a modification could be made which would hold restrikes to a minimum on all tests. The need was for an interrupter which at low currents (120-amp normal capacitor current) would deionize the arc path and establish dielectric strength equal to 2.5 times the normal line to ground value in 0.5 cycles. Such performance was already given by high voltage breakers with three-cycle interrupting times. These breakers had oil pumps which injected small quantities of oil in the interrupter to effect low current interruption. The addition of this feature to the 34.5-kv De-ion Grids was chosen as the solution, after it and other alternatives were studied in a series of high power laboratory tests.

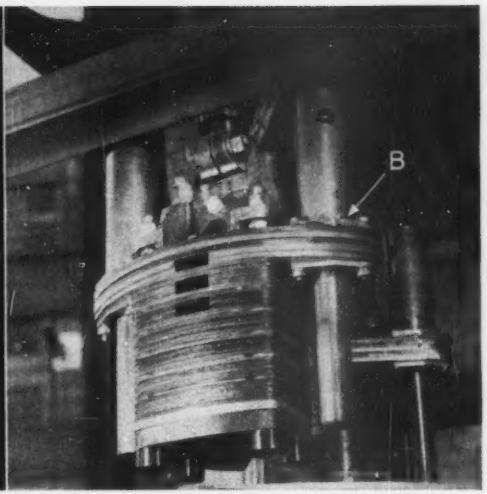
The requirement was that the breaker switch the 34.5-kv circuit without causing disturbance on a connected 4-kv grounded neutral circuit. The high power laboratory circuits were connected to approximate the Indianapolis system circuits. Voltage was generated at 13.2 kv and stepped up by transformers to 34.5 kv. A circuit breaker switched a three phase ungrounded bank of capacitors at this voltage. Connected to the 34.5-kv circuit was a bank of power transformers which stepped the voltage down to 5.2 kv, the nearest available step to 4 kv. Lightning arresters of the same

De-energizing Operations Using Standard Breaker

Test No.	Time	Re-Ignitions	Restrikes	Times Normal Max. 34.5 kv Phase to Ground Bus Voltages	System Disturbances
12	10:30A	1	1	1.85	None
14	10:40A	4 (see FIG. 3)	1	2.2	C ph. 3 kv valve type L.A. blown up on N.'s 10th St. E. of Main St. The 34.5 kv line above was relayed by arc.
16	9:10P	1		1.0	None
18	9:15P	3	1	2.27	Blew up the new 3 kv valve Type L.A. which replaced the L.A. previously blown up on May 13 on C ph. of F24.
20	10:35P	1	1	1.80	C ph. 3 kv valve type L. A. blown up on F24 at riser pole on N./s 10th St., E. of Main St.



MOVING CONTACTS fitted with arms (A), charge pump, compress piston drive springs by raising pistons during closing



PUMP ASSEMBLY (B) mounted in interruptor top injects oil into space between contacts to effect low-current interruption

type used on the 4-kv circuits were connected to this circuit, as the voltage was still within their rating, but after being destroyed they were replaced by a different kind.

Oscillographic records . . . Oscillograph records were made of the capacitor currents, the capacitor voltage and the bus voltages, sometimes on the 34.5-kv bus and sometimes on the 5.2-kv bus. To establish that the circuit gave approximately the same results as the circuit at Indianapolis, tests were made with the breaker equipped with the same type of interrupter, and the results were similar, even to the prompt destruction of the set of 3-kv lightning arresters.

Modified Breaker Does Trick . . . Various alternative interrupters were tried to establish their performance on this circuit. The one which gave the best performance was a modification of the De-ion Grid. Parts in the top 1¼ in. of this interrupter were replaced by an assembly which caused oil to be pumped into the space between the contacts. The moving contacts were fitted with arms which operated the pistons in the oil pumping devices. Ends of the moving contacts were reduced in cross-section so that the arc position was closely determined and the oil passages formed in the upper section of the grid could be brought close to the arc and so that only a small quantity of oil needed to be pumped.

The device was prepared for operation by the moving contact charging the cylinders with oil by raising the pistons and compressing the piston driving springs during the closing stroke. On opening, the moving contacts draw the arcs and release the pistons which, under the action of the springs, force oil under pressure into the arc space to drive out the gases produced by arcing.

High power laboratory tests with these experimental grids showed that on 21 tests there was only one restrike and that the maximum voltages produced by it were 1.9 times normal on both the 34.5-kv bus and on the 5.2-kv bus. On the basis of this, it was decided to use this device for switching the capacitor, but further testing was conducted to determine that the best combination of elements had been selected. On 21 tests at 33 kv the breaker restruck once with a maximum voltage on the 5.2-kv bus of 1.4 times normal voltage, and on 17 tests at 38 kv, it restruck once with a maximum voltage on the 5.2-kv bus of 2.3 times normal voltage.

The set of interrupters was made to this design for use on the system.

Because of the piston-driving springs which were compressed during the closing stroke, the closing effort required by the breaker during the latter part of the closing stroke was increased. This was provided by modifying the bell-crank between the horizontal and vertical pullrods so that the mechanism operated with a more favorable mechanical advantage at this part of the stroke.

The breaker must operate as a protective device in case of fault so it was checked in the high power laboratory to be sure it was capable of closing against, and opening, short circuits which it could encounter at 34.5 kv.

After modifying the interrupters on the capacitor breaker at Indianapolis, a final series of 22 de-energizing tests was made. There were no system disturbances involving damage to system equipment. Only one restrike and one re-ignition occurred in this series of tests. Maximum voltages indicated for the restrike were 2.1 times normal on the Main St 34.5-kv bus and 1.9 times normal on the Allison Sub No 2 4-kv bus. The oscillogram of Fig 3 illustrates the remaining 20 de-energizing operations with no restrikes or re-ignitions.

The capacitor bank was put into regular operation on the following schedule: Monday through Friday, on at 8:00 am and off at 4:00 pm; Saturday, on at 8:00 am and off at 12:00 noon; off on Sundays and holidays. To date no damage to system or capacitor equipment has occurred.

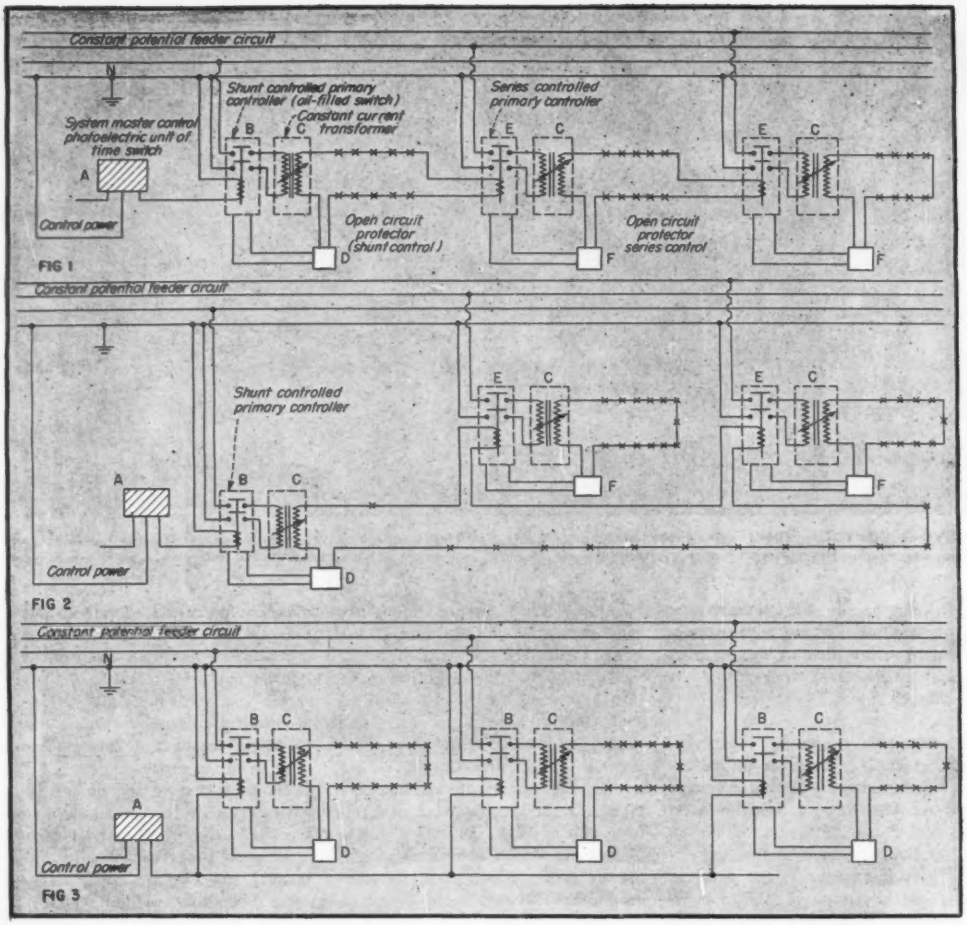


FIG 1—SERIES "CASCADE" SYSTEM with shunt controlled first stage and series controlled subsequent stages. FIG 2—Shunt controlled "parent" circuit with series controlled "secondary" circuits. FIG 3—Series system with several shunt controlled circuits and still dependent on one "master" control. A constant potential feeder supplies above three systems

How Modern Street Lighting

A comparative analysis of the advantages and reliability of various control methods for series, multiple, and alternative combinations of street lighting systems

There are six widely used street lighting control methods in use today: (1) A system "master" control, (2) a "parent" control, (3) a pilot wire control, (4) saturable reactors, (5) secondary steps on a constant-current transformer, and (6) carrier current.

In this article these control methods and equipment will be analyzed from a functional standpoint. In this discussion, the economic side will not be emphasized. However, since the two viewpoints cannot be completely divorced, some pertinent economic background and remarks will be presented.

Probably the easiest way to emphasize the circuit problems and characteristics of series and multiple street lighting circuits is to study various control methods.

Series Systems . . . Fig 1, 2, and 3 show three methods of control for series circuits. Including variations on

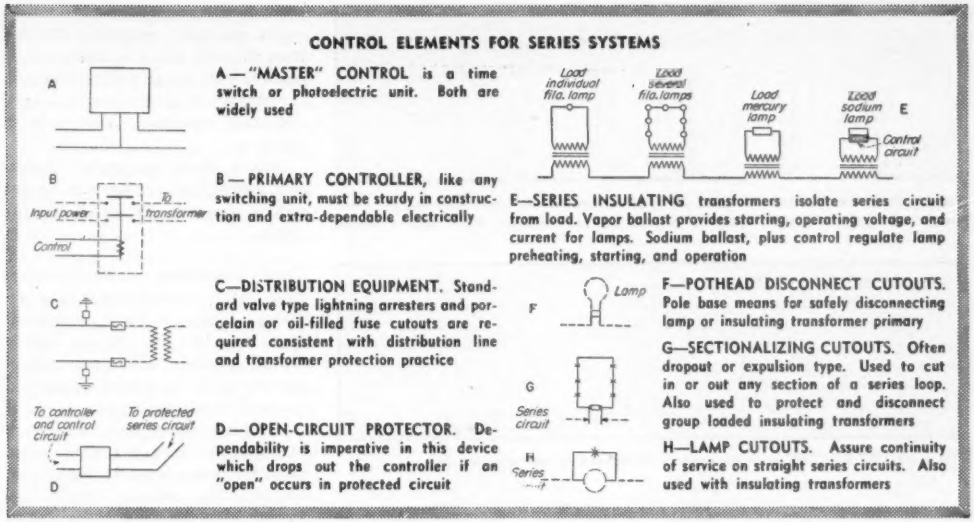

CONTROL ELEMENTS FOR SERIES SYSTEMS
A
A—"MASTER" CONTROL is a time switch or photoelectric unit. Both are widely used
B
Input power
To transformer
Control
B—PRIMARY CONTROLLER, like any switching unit, must be sturdy in construction and extra-dependable electrically
C
C—DISTRIBUTION EQUIPMENT. Standard valve type lightning arresters and porcelain or oil-filled fuse cutouts are required consistent with distribution line and transformer protection practice
To controller and control circuit
To protected series circuit
D
D—OPEN-CIRCUIT PROTECTOR. Dependability is imperative in this device which drops out the controller if an "open" occurs in protected circuit
Load individual fila. lamp
Load several fila. lamps
Load mercury lamp
Load sodium lamp
E
Control circuit
E—SERIES INSULATING transformers isolate series circuit from load. Vapor ballast provides starting, operating voltage, and current for lamps. Sodium ballast, plus control regulate lamp preheating, starting, and operation
F
Lamp
F—POTHEAD DISCONNECT CUTOUTS. Pole base means for safely disconnecting lamp or insulating transformer primary
G
Series circuit
G—SECTIONALIZING CUTOUTS. Often dropout or expulsion type. Used to cut in or out any section of a series loop. Also used to protect and disconnect group loaded insulating transformers
H
Series
H—LAMP CUTOUTS. Assure continuity of service on straight series circuits. Also used with insulating transformers

FIG 4—AUXILIARY CONTROL ELEMENTS used as components in control circuits for series street lighting systems

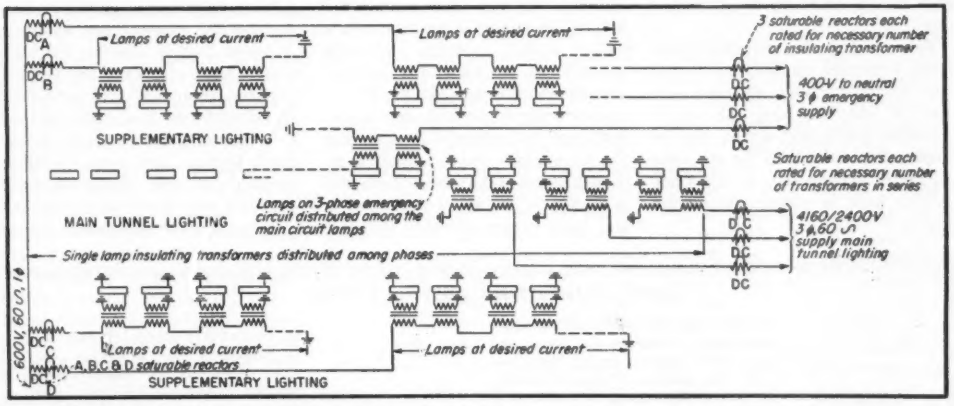

DC A
DC B
Lamps at desired current
Lamps at desired current
3 saturable reactors each rated for necessary number of insulating transformer
400-V to neutral 3 ϕ emergency supply
SUPPLEMENTARY LIGHTING
Saturable reactors each rated for necessary number of transformers in series
MAIN TUNNEL LIGHTING
Lamps on 3-phase emergency circuit distributed among the main circuit lamps
4160/2400V 3 ϕ 60 ~ supply main tunnel lighting
Single lamp insulating transformers distributed among phases
600V, 60 ~, 1ϕ
DC C
DC D
Lamps at desired current
Lamps at desired current
A, B, C & D saturable reactors
SUPPLEMENTARY LIGHTING

FIG 5—FLUORESCENT LAMP CONTROL SYSTEM used with main and supplementary lighting in tunnel installation

Control Methods Work

WILLIAM LONGMUIR, District Lighting Specialist, Apparatus Dept
General Electric Co, Atlanta, Ga.

the basic control method, Fig 1 and 2 account for an estimated 60% of present day series systems and Fig 3 the remaining 40%.

Fig 1 shows true cascade control. It combines a "master" control, usually a photoelectric unit or a time switch, one shunt controller to energize the "base" series circuit, with series controllers providing the cascading means between each successive dependent series circuit. Size of the practical load is limited as to how much lighting should depend on one master control. Each constant-current transformer can be of optimum size. Very few moving parts exist. A failure in any of the series circuits also shuts down all those "behind" it in the cascade. This system can readily be expanded or added to in any direction desired; also a new base circuit may be started easily.

Fig 2 is similar to cascade control except the cascading is carried only through one stage and all the secondary series controllers are placed in one circuit; here then, is a "parent" circuit. In this case, if one of the dependent circuits fails, no other is affected.

Fig 3 indicates isolation of each series load by means of pilot wire control of individual controllers. The

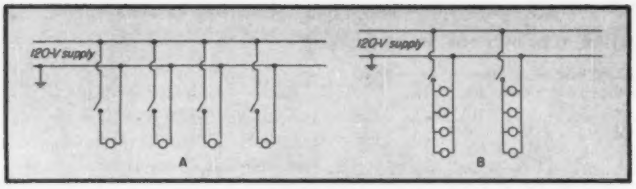


FIG 6—PHOTOELECTRIC OR TIME SWITCH control of (A) individual and (B) small groups of luminaires most frequently used on low voltage, high current supply

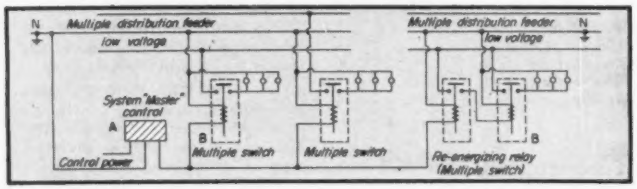


FIG 7—PILOT CIRCUIT multiple control incorporating multiple switches

possible disadvantages of cascading are eliminated but the addition of the pilot wire is necessary to accomplish this.

Series circuit characteristics themselves determine the inherent controls and circuit methods required. As seen in the diagrams, the 4-wire grounded distribution system may be employed in many cases for economical use of copper—the neutral being utilized both in power and control circuits.

Grounding of the series lighting circuits themselves is not recommended, although this can be a controversial subject. A ground in the high-voltage circuit invites lightning and other grounds. A ground at the constant-current transformer and another at the extremity of the load saves copper but keeps the portion of the load near the transformer under constant high-voltage stress. Some systems have used a detachable ground at the center of the loop (which balances stress to ground) as an easy means of locating opens and other grounds. This has been effective, but it is doubtful how much trouble the ground itself caused.

Auxiliary control elements needed and their importance are shown in Fig 4.

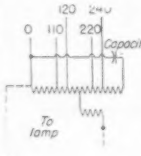
Optical characteristics of fluorescent lighting are causing it to receive serious attention in street lighting circles.

Tunnel Installation . . . An interesting series circuit control system was developed originally for a fluorescent application in the Harris County (Texas) Tunnel. The basic control idea shown in Fig 5 has been adapted to several other installations.

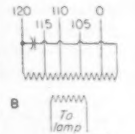
The primaries of lamp ballasts are connected in series and are supplied through a saturable reactor for current control. The separate circuits are broken down according to purpose of the respective lamp load, i.e. portal lighting, main tunnel lighting, etc; also, keeping the reactor sizes within an optimum limit is a major consideration. The dc control of the saturable reactors provides plenty of flexibility for day-to-night tunnel changes and for seasonal effect on the fluorescent light. Desired light levels can be obtained at any time. This method provides the ultimate in smooth control.

A system of fluorescent lighting

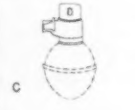
CONTROL ELEMENTS FOR MULTIPLE SYSTEMS



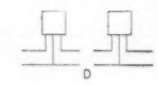
A—MERCURY BALLASTS provide proper open-circuit voltage to fire lamps and after start maintain correct lamp current. Tap selection as close as possible to existing line voltage is important to get full light output and long rated life of mercury lamps. As shown, ballast usually includes capacitor for power factor correction



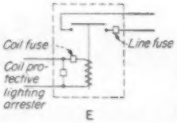
B—SODIUM BALLASTS are tapped for selection according to existing voltage. May be provided with power factor correcting capacitor. In conjunction with control panel it provides starting and operating conditions for the lamp. Control panel allows for an interval of cathode preheating and for starting and operation of the lamp



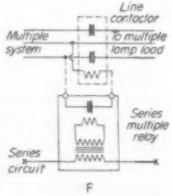
C—INDIVIDUAL LUMINAIRE photoelectric control. This unit for isolated locations may be used also where interwiring costs (installation and maintenance) outweigh control costs (initial and maintenance). Plug-in replacement results in continuity of service and easy maintenance



D—SEPARATELY MOUNTED time switch or photoelectric unit. In multiple circuits these devices provide "master" control. Whether connected to individual or groups of lamps. Up-to-date designs of both are capable of providing "correct to the minute" operation of lighting loads



E—MULTIPLE SWITCHES are designed for outdoor use. A recent type has been incorporated into a standard meter base. As indicated, line and coil protection may be built in



F—SERIES-MULTIPLE RELAY used to control multiple load from a nearby series circuit. It is an insulating transformer with the addition of a multiple switch, usually used for a small isolated load

FIG 8—CONTROL ELEMENTS used as components in control circuits for multiple street lighting system

control more closely related to present street lighting equipment, both from physical and cost standpoints, could utilize a constant-current transformer tapped on the secondary. The taps would be used for a warm weather current setting and a cold weather current setting to allow for seasonal temperature effects on the fluorescent lamps' output. Conventional control equipment would be used, and again the ballast primaries are in series.

Multiple Systems . . . Multiple or low voltage-high current supply, provides a control problem at the opposite extreme to that of series. Notwithstanding major exceptions such as carrier current, a multiple system must provide for: (1) High inrush lamp current, (2) handling of relatively large load per transformer, (3) voltage drop and (4) short circuit considerations, with a system of small load tap-off from feeders and, in some cases, re-energizing relays. Where multiple systems are available, control and cascading of control may be accomplished as shown in Fig 6.

The schemes in Fig 6 are alike in that they both refer to either photoelectric or time switch control of single or small groups of luminaires. Therefore, neither system requires any pilot wire. The difference between the systems is: In the individual control case, more control units are required, but for the group control, pole interwiring is required. Initial cost for either system can be compared easily, and the maintenance cost can be compared after experience with both types.

Newest development in individual control is a photoelectric unit which is built as an integral part of a standard luminaire hood. This unit provides a plug-in replacement feature for group maintenance. With features such as the all-season automatic control, simple installation, and no pilot wire required, this unit is ideal for isolated locations (in some cases dangerous intersections at which lighting could not previously be economically justified). Further, the independence of each unit plus the lack of any need for interwiring of poles has resulted in this type being chosen and justified for some coordinated urban areas.

Fig 6 is representative of a general method of mulitple control, and although a number of control units are required, present day photoelectric controls and astronomic time switches do a creditable job.

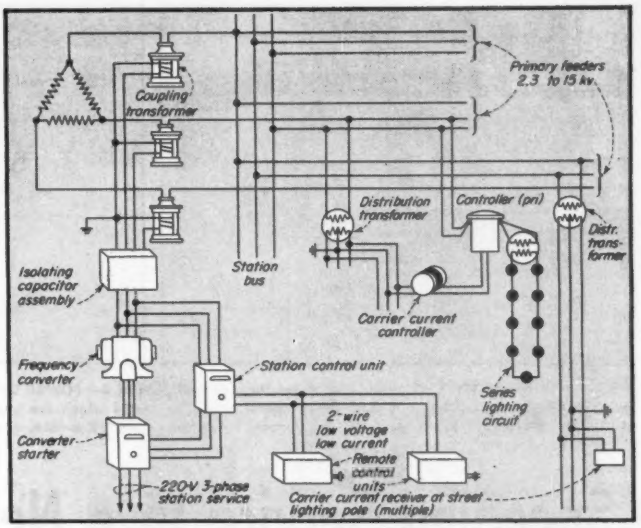


FIG 9—CARRIER CURRENT remote control indicated for a street lighting system

Fig 7 shows the generally used pilot-wire system, incorporating magnetic multiple switches and reenergizing relays for cascading. This control system is often justified by only partial assessment of distribution circuits being charged to street lighting. Advantages of low-voltage circuits in equipment investment and maintenance also help to justify the pilot wire system, despite the greater number of control devices being required, and the moving parts maintenance problem.

Control elements of the multiple systems covered thus far are shown in Fig 8. Included is the series-multiple relay (F) which is the common method for transferring from series to multiple circuits. This device is an insulating transformer plus a multiple switch. It is particularly effective where a small, relatively isolated load is to be serviced, and multiple distribution is indicated, but a series street lighting circuit is nearby.

Carrier current, as a means for controlling street lighting, has been utilized in only a few installations. These installations were, in general, widespread areas involving great numbers of luminaires, or complete system revamping projects. This has been because of: (1) High initial control station expense and (2) intricacies of system "traps" and controls required to make sure control power reached its receivers.

Usually carrier current is used to control signs, show windows, pumps, and domestic off-peak loads such as water heaters, in conjunction with any street lighting activity to further split up costs. Fig 9 indicates series coupling of the carrier control power to the distribution feeders; shunt coupling may be utilized also, but usually results in more power necessary at the generating station due to higher system losses and higher voltages needed. The system is very flexible in its operation, maintenance is very low, and with correct installation, it is reliable.

Many individualities exist in street lighting circuits. All the equipment, systems, and several alternative combinations of these systems described above have been used successfully.

Street lighting practice as a whole is aimed at adequate lighting at the lowest possible cost. The word "adequate" as used here leads to many different views on optics, light levels, etc., which in turn affect the "least possible cost." Regardless of method, control is always an important, if not the key factor in the choice of any street lighting system.

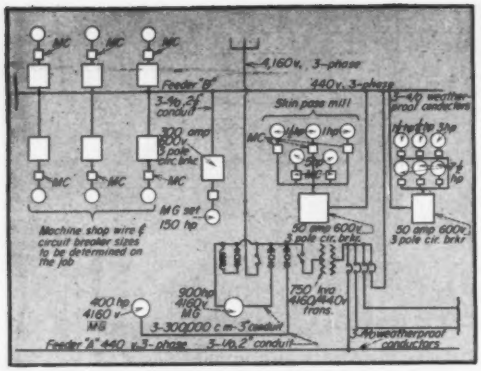

MC
4,160v, 3-phase
440v, 3-phase
Feeder "B"
3-No 2" conduit
Skin pass mill
3-4/0 weather-proof conductors
300 amp 600v 3 pole circ. brkr
MG set 150 hp
Machine shop wire & circuit breaker sizes to be determined on the job
50 amp 600v 3 pole cir. brkr
400 hp 4160 v MG
900hp 4160v MG
750 kva 4160-440v trans.
3-300,000 c m-3"conduit
Feeder "A" 440 v, 3-phase 3-4/0 2" conduit
3 No weatherproof conductors

FIG 1—**WIRING LAYOUT** of power equipment for steel mill, including the incoming line and distribution center, made by utility for customer. (Only part of the layout is shown)

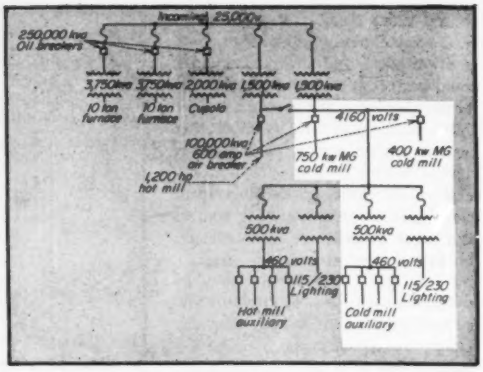
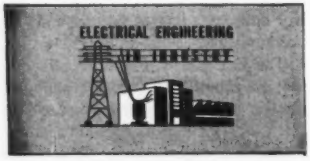


FIG 2—**POWER DISTRIBUTION** system for an integrated steel mill which the customer would ultimately build. The highlighted portion was initial part of the installation

Speeding Service to a New Steel Mill

How careful planning with a new mill customer not only speeded utility's service, but saved installation costs and paved way for additional loads without changing customer's equipment

F. F. DICKMANN, Senior Industrial Engineer
West Penn Power Co, Pittsburgh, Pa.



HERE is a good example of careful planning, with a new customer, for the power supply to a new plant. The customer's operation became profitable to him earlier. We started selling power to the customer earlier. The customer has a power system that functions properly and can be expanded readily with no change in present equipment. We spent a minimum of money in extending our facilities to this customer and our plans are laid for serving the additional load which will come to us as this plant develops into an integrated mill.

Several years ago two men with vision and experience in steel making organized a steel company. While the company consisted of only these two men and a stenographer, they came to us for an estimate of power costs to operate the plant they would build, and for any other help we might offer. A conference was held with the owners and their consulting engineer. Their ultimate plans and hopes for the future were laid on the table.

We accepted the responsibility of guiding the customer in matters relating to power. The first job was to recommend a selection of voltages. This was tackled by first laying out a power system for the plant which the customer expected ultimately to build, and coordinating it with West Penn's local system. Two voltages, 25,000 and 4,160, were available in that area from a nearby substation. With these as an influence, this system was laid out (Fig 2) as one that would be adequate for an integrated mill which it was hoped would develop within a few years. The size of the load required that the incoming line be 25,000 v.

For the electric melting facilities direct step-down from the 25-kv system would be controlled by a breaker on the high side of each furnace transformer. For the distribution voltage within the plant, 4,160 v was selected to be supplied by 1,500-kva three phase transformers. In this selection we would urge the customer to purchase transformers that are standard with us so that in case of a transformer failure, one of ours would readily fill his needs. It was recommended that transformers be protected by fused disconnects rather than breakers. Large motors would be 4,160 v, small motors 460 v supplied by unit substations.

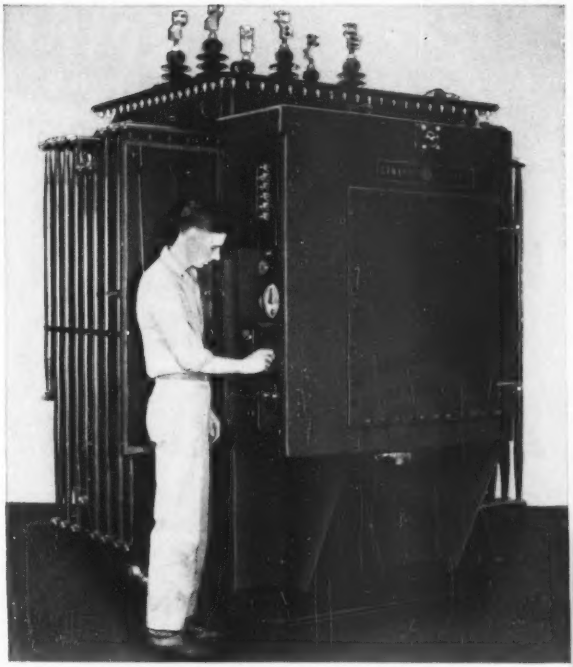
Since only the cold roll mill was constructed, only that part of the power system was required. As this load was within the capacity of our existing 4,160-v facilities, it was unnecessary to build 25-kv facilities.

When mill equipment had been selected and a location layout made, prints were furnished us for the purpose of laying out wiring system (Fig 1).

West Penn's 4,160-v facilities were adequate to take full voltage starting of the 400-kw M.G. set but the inrush on starting the 900-kw set could not be tolerated and a reduced voltage starter was recommended. Later when the incoming supply is changed to 25 kv, full voltage starting of this machine will be acceptable and the starting breaker can be eliminated and

(*Continued on page* 101)

Class I Accuracy in these G-E Regulators —at no extra cost



GENERAL ELECTRIC'S TYPE MLT three-phase 32-step regulators are available in standard ratings for circuits up to 25,000 kva and 69,000 volts.

GENERAL ELECTRIC'S TYPE IRS induction voltage regulators provide the finest regulation obtainable for heavily loaded, urban feeders.

This means better utilization of your feeders . . . they can now carry heavier loads for greater distances.

Because of today's increasing power demands on your feeders, General Electric is especially proud to be the leader in bringing you this significant new system design tool at NO EXTRA COST!

The controls on all station-type feeder voltage regulators now meet rigid ASA Standards for Class I devices. This means that they have an accuracy of at least 99% — regardless of operating changes in temperature; frequency, or load.

With these highly accurate controls on your regulators, more drop can be tolerated in a regulated feeder without at any time exceeding established voltage limits. Therefore your older feeders can carry heavier loads and your new construction can be designed with this increased load-carrying capacity in mind.

For further information on what Class I accuracy can mean to you, get in touch with your G-E representative. *General Electric Company, Schenectady 5, New York.*

404-82

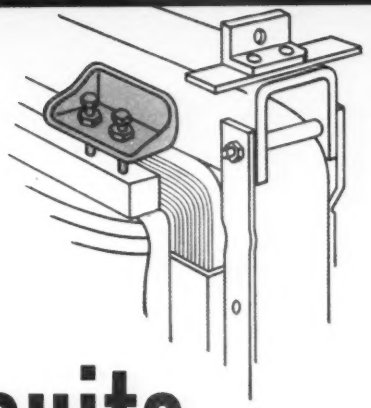
GENERAL ELECTRIC

SPIRAKORE* TRANSFORMERS

mechanical strength to

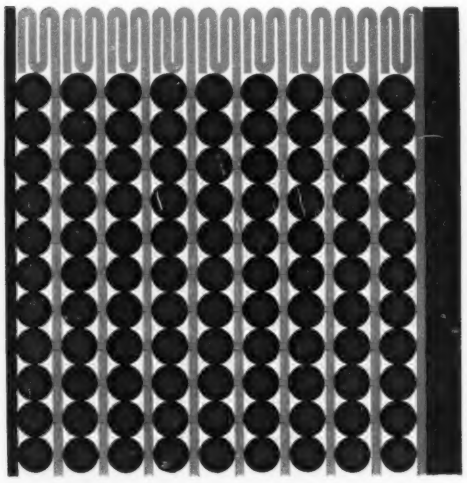
An improved clamping construction gives the modern Spirakore transformer greater mechanical strength than ever before.

As an example, on transformers 75 kva and larger the ingenious jack-screw device shown at the right holds the windings accurately and permanently in place.



take short circuits

General Electric's improved Spirakore* transformer is outstanding in its ability to resist short-circuit stresses. An improved clamping construction, shown above, is part of the reason Utilizing the mechanical strength of the paper insulation, as well as its electrical strength, is another. Also, the basic design of the wound core adds strength as compared with older designs.



Edges of the tough paper insulation are folded over the winding layer to hold coil conductors securely in position even under short-circuit conditions. On smaller units the paper insulation is pretreated with a special varnish which softens and flows around each conductor when core-and-coil unit goes through heat treating. Upon cooling, this thermo plastic material permanently hardens to bond conductors and insulation together.

Important as all this is, it is still only one advantage you get with today's Spirakore distribution transformers. You get a wound core in single-phase and most three-phase ratings—a G-E development that has resulted in direct savings to utilities that now total millions of dollars. You get high impulse strength—so high as to have made lightning failures almost insignificant on transformers delivered since 1943. You get vacuum-tight sealing that stops breathing, prolongs oil and transformer life. You get an improved Melaglyp† paint that increases durability to weathering by 50 per cent.

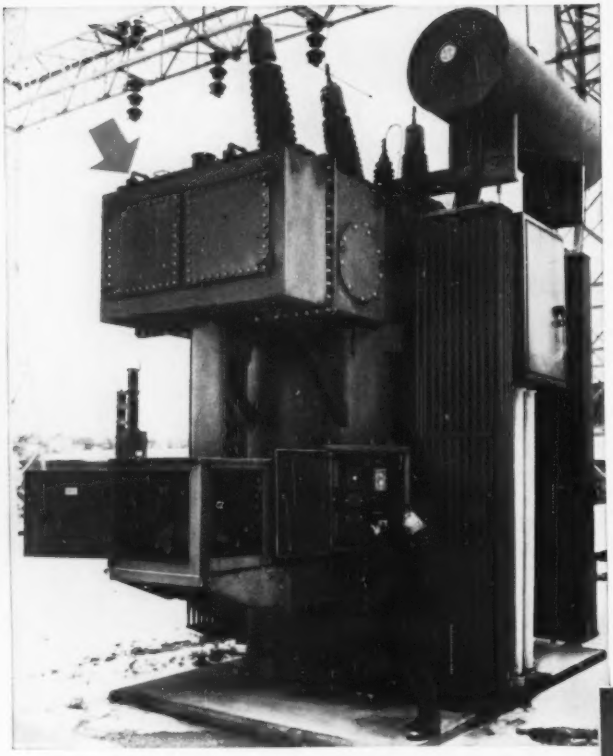
All of these changes have kept Spirakore ahead—kept it the standard for others to try to equal. It's the finest distribution transformer you can buy.

*Registered trademark of the General Electric Company.
†A new, greatly improved G-E paint made with melamine-modified Glyptal (registered trademark of the General Electric Co. for alkyd resin).

If you haven't seen this 32-page, full-color book on the Spirakore transformer, get one from your local G-E representative, or write 402-108, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

402-108



At its current rate of operation the load-ratio-control equipment on this G-E transformer at Lewiston, Maine, will require no servicing until about 1962.

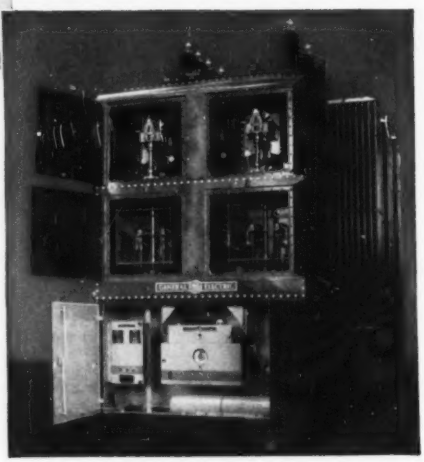
106,554 tap changes since 1947

Arcing tips inspected, found good for 400,000 more operations

Central Maine Power Company recently inspected the load-ratio-control equipment on this transformer rated 13,333 kva (with fans), 115,000Y to 12,000-volts. This was the first opportunity the company had to inspect contacts since installation in 1947. The counter read 106,554 tap changes under load. Here are pertinent parts of the report:

> *"Arcing tips are in good condition, and should last 500,000 tap changes as estimated in the G-E Instruction Book. All bearings, pins, cam rollers and cam surfaces are in excellent condition and show no wear. Oil was slightly carbonized and insulating rods and panel showed some carbon streamers, but there were no carbon deposits in the areas protected by electrostatic shielding. Oil was filtered and re-used. Surfaces were cleaned."*

This report is typical. *At its present rate of operation, this equipment will not require further servicing for about 11 more years.* General Electric has now installed load-ratio-control equipment on 37,665,618 kva of transformers—and the reliability record matches the outstanding record of the transformers themselves. *General Electric Company, Schenectady 5, New York.*



On more recent G-E transformers the contactor compartment is below the one for tap selectors instead of in front of it, to further improve accessibility. The motor drive has also been made more accessible and all controls have been grouped on a hinged panel for operating convenience. Basic design, however, remains unchanged, including electrostatic shielding that prevents dangerous carbon deposits.

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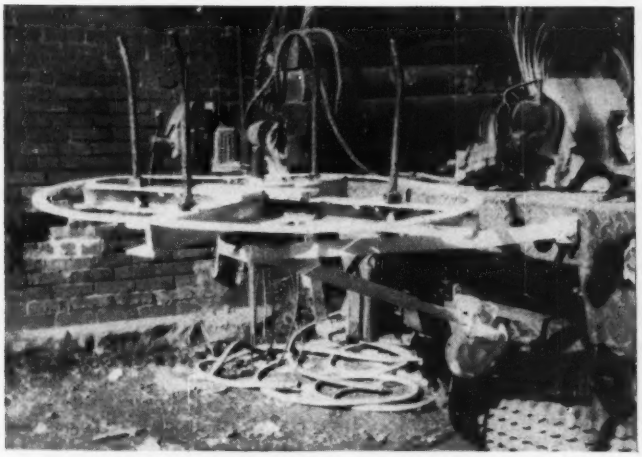
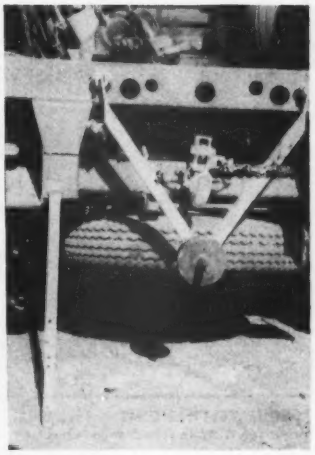
GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



REEL SUPPORT in operating position on rear of line truck facilitates the task of handling wire reels. Brace rod for reel support fits into trailer pintle



SWUNG DOWN, reel support does not interfere with work at rear of truck

Wire-Reel Support Mounted at Rear of Truck

M. C. CLARK, Supt. of Distribution
and
G. W. ARTHUR, Distribution Dept
Appalachian Electric Power Co
Point Pleasant, West Virginia

An adjustable hinged reel support has been developed for attaching to the rear of trucks. It can be readily loaded with a wire reel or swung down out of the way when not being used.

The support (1) saves valuable space in the truck, (2) permits sliding heavy wire reels directly from the truck bed onto the reel spindle or vice versa, (3) will accommodate reels of different diameters, and (4) places the reel where it can be easily used for pay out or take up of wire.

The rig is easily assembled and dismounted and can be readily collapsed or lifted into operating position. It has been found adaptable to practically every job handled.

The wish-bone supporting frame is made of 1¼-in. angles and has a reel spindle and bearing plate welded to the outboard end. A telescoping brace permits leveling the reel support when truck is parked on grade. Upper end of brace is a 1-in. IPS pipe, within which slides a 1-in. steel rod; adjusting holes in the pipe and a ⅜-in. bolt permit adjustment of brace length. Upper end of pipe is flattened to fit into slot in frame under spindle. Lower end of brace rod rests in trailer hitch.

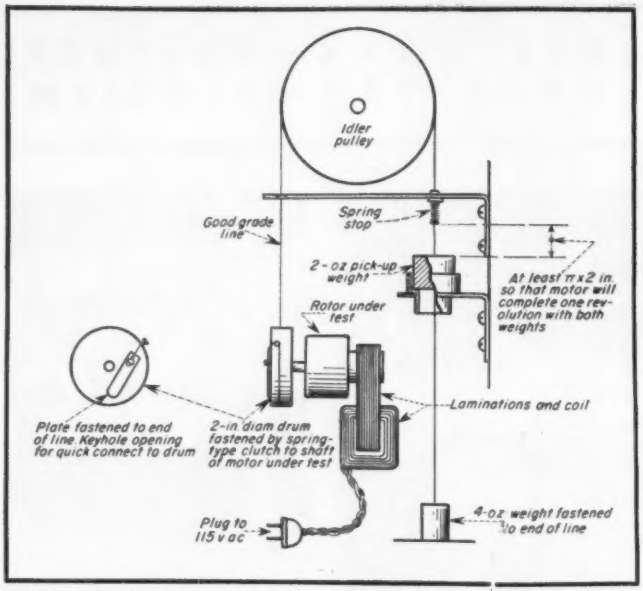
Any reel might be used on this type of support. The one shown is composed of 3-in. channel cross-pieces with a spindle hub and bearing plate at the intersection, reinforced top and bottom by ¼ x 3-in. plates. Additional reinforcing plates welded to the cross-pieces have holes for adjusting positions of spokes so different-size coils can be accommodated. The rim is strap iron. Cross-pieces might be made of angle iron or 2x4-in. lumber to reduce weight.

Quick Torque Tester for Demand Meter Motors

R. O. SMITH
Meter Division
Boston Edison Co

To test the torque of Telechron synchronous motors used in operating watthour meter demand registers, the Boston Edison Co employs a small dynamometer arrangement. The outfit is mounted on a portable stand with an 8x10-in. base and height of 18 in. The synchronous motor under test has a barrel shaft extension to which a circular brass drum of two-inch diameter is attached by a spring-type clutch. This facilitates connecting and removing the drum from the shaft.

At the upper part of the set-up an idler pulley is mounted on a shaft. This carries a cord from the drum around the pulley to connect with two


Idler pulley
Spring stop
Good grade line
2-oz pick-up weight
At least π x 2 in. so that motor will complete one revolution with both weights
Rotor under test
Laminations and coil
Plate fastened to end of line Keyhole opening for quick connect to drum
2-in diam drum fastened by spring-type clutch to shaft of motor under test
Plug to 115 v ac
4-oz weight fastened to end of line

TORQUE TESTING UNIT checks ability of demand meter motor to start with a torque of 4 oz-in., and then complete run to spring stop with a 6 oz-in. torque

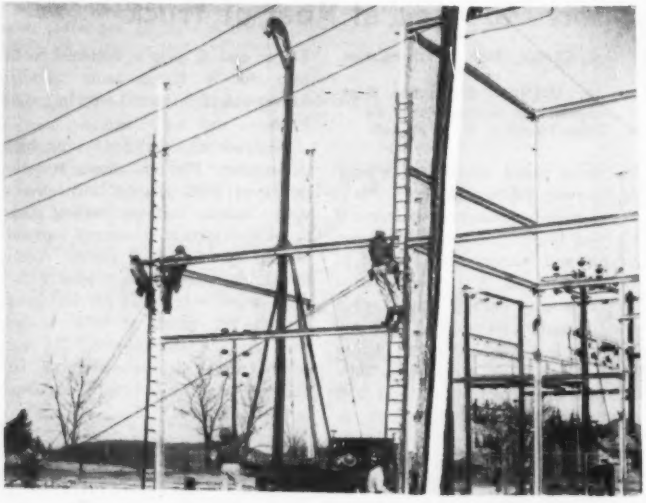
weights which provide the required turning-moment test.

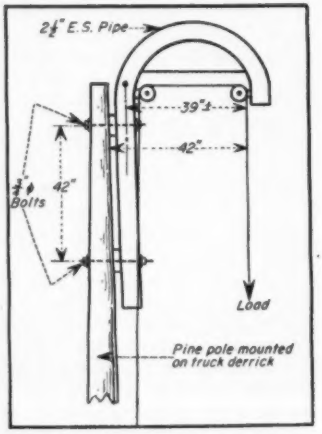
One weight, a 4-oz metal cylinder, is fastened to the lower end of the line. Resting on a bracket above this weight is a 2-oz pickup weight through which the cord passes. When the drum has been fastened to the motor shaft and the motor started, it raises the 4-oz weight; as the line winds up, the 2-oz weight is added to the load. The weights are brought to a stop by a spring at the upper end of their travel, completing the test.

Unless the motor will operate without stalling (1) when accelerating from standstill to the end of the pick-up run with the 4-oz weight, and (2) with the total weight of 6 oz for one complete revolution of the motor, it is set aside for attention. The motor must start properly with a torque of 4 oz-in., and complete its run to the spring stop with an ultimate torque of 6 oz-in.

During tests, the synchronous motor barrel is held in place by a quick-connect clamp.

Substation Construction Speeded by Special Gin





BENT-PIPE GIN detail is shown above. At left, use of gin speeds erection of steel during substation construction

JOHN W. PARHAM
Oklahoma Gas & Electric Co
Oklahoma City

Substation construction is facilitated by a special gin which can be used for hoisting steel, installing air break switches, and other equipment. The attachment consists of a 2½-in. steel pipe, bent and fastened to the top of a pine pole as shown in the drawing.

Because this gin pole overhangs, setting steel and other apparatus can be lifted perpendicularly. It is particularly useful in setting switches or other bulky equipment. Using 2½-in. D-E.S. pipe, this gin will support 40 ft of 6WF25 beam weighing 1,000 lb. If 2½-in. E.S. pipe is used, maximum load should be limited to 677 lb.

"GENEVA ACTION"

Indicating Demand Register

low reset load on motor

long motor life

positive reset by Geneva action — no shock

minimum number of parts

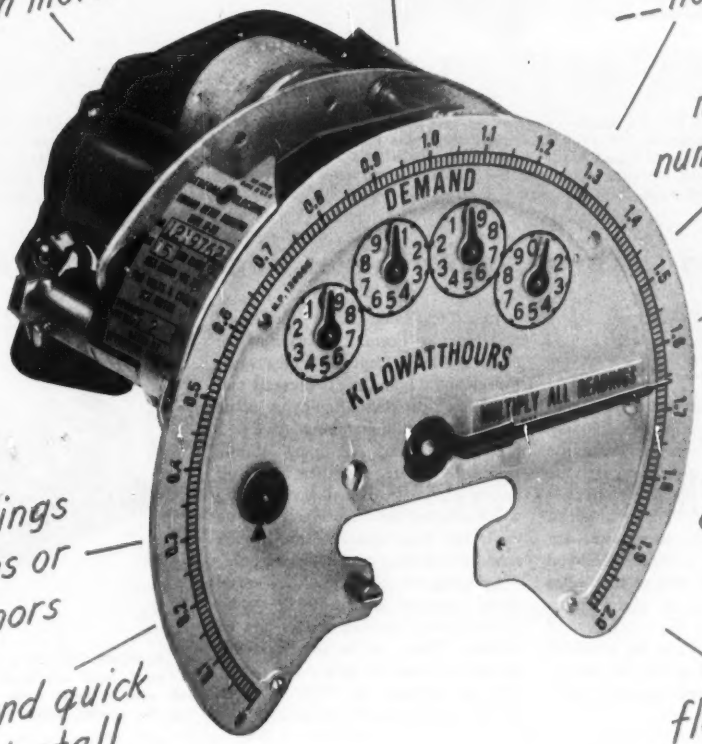
long scale 9½ inches

simple adjustments

maximum flexibility in demand measurements

easy and quick to install

no springs latches or governors



TYPE M-30 INDICATING DEMAND REGISTERS may be installed on standard General Electric watthour meters. Type M-31 cumulative demand register is also available. For more information, contact your nearest G-E representative or write for M-30 bulletin GEC-413 or for M-31 bulletin GEC-272. General Electric Company, Schenectady, N. Y.

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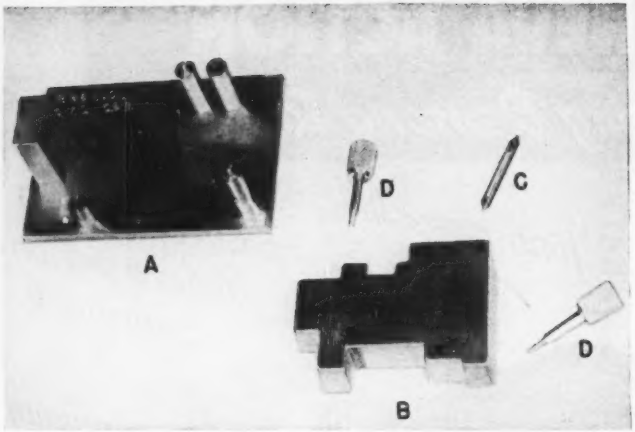
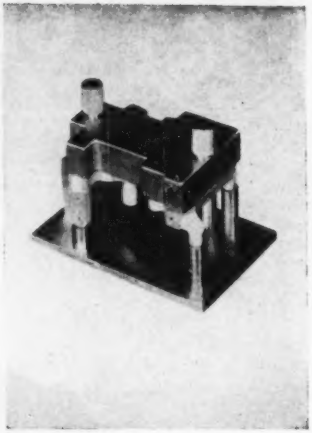


1 WITH THIS JIG and accessories, you can be sure of locating dead center of frame clamping screw. (A) Brass and steel stand for holding frame during centering and drilling; (B) jig of hardened steel has seven lead holes for guiding center drill; (C) these holes are directly in line with the screw holes in the motor frame; and (D) steel thumb screws are used to clamp the jig to the motor frame



2 JIG is clamped to motor frame and placed on stand (A). Enter center drill in a guide hole in jig. Use center drill only to start a positive center hole in broken screw . . . See next step below

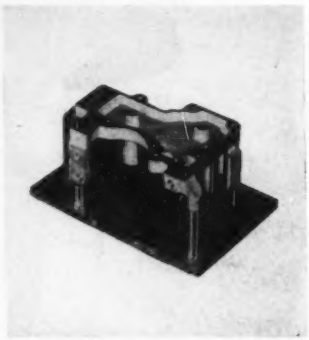
Jig Aids Screw Removal, Saves Register Motor Frame

E. H. TYSON
Superintendent of Meters
Pennsylvania Power & Light Co
Hazleton, Pa.

The somewhat complex and delicate construction of cumulative demand registers often promotes the use of special jigs and fixtures to expedite their maintenance. Their use not only results in a uniformly better grade of workmanship, which is requisite for the longer periods between scheduled returns to the shop, but accomplishes worthwhile savings in maintenance costs. The catch is that very few of such specialized devices are available on the market. They have to be developed by personnel in power company meter departments.

One such device has been developed and built by Foster L. Carter of the General Meter Dept of Pennsylvania Power and Light Co. It corrects and simplifies a problem often experienced when disassembling motors of RW-2 registers: Frame clamping screws frequently freeze, and then break off during removal. The device is a jig which enables the repairman to locate easily the dead center of the broken screw for drilling and retapping.

By using this jig as described in the photo captions, nearly 100% of the frames having broken screws can be repaired. Prior to its use, a center punch was used to locate the center hole for drilling, and 50% or more of these frames had to be scrapped.



3 REMOVE JIG when broken screws have been centered. Drill screws out with a twist drill. After removing the screws, retap the screw holes

Stick and Torch Method Saves Solder in Joints

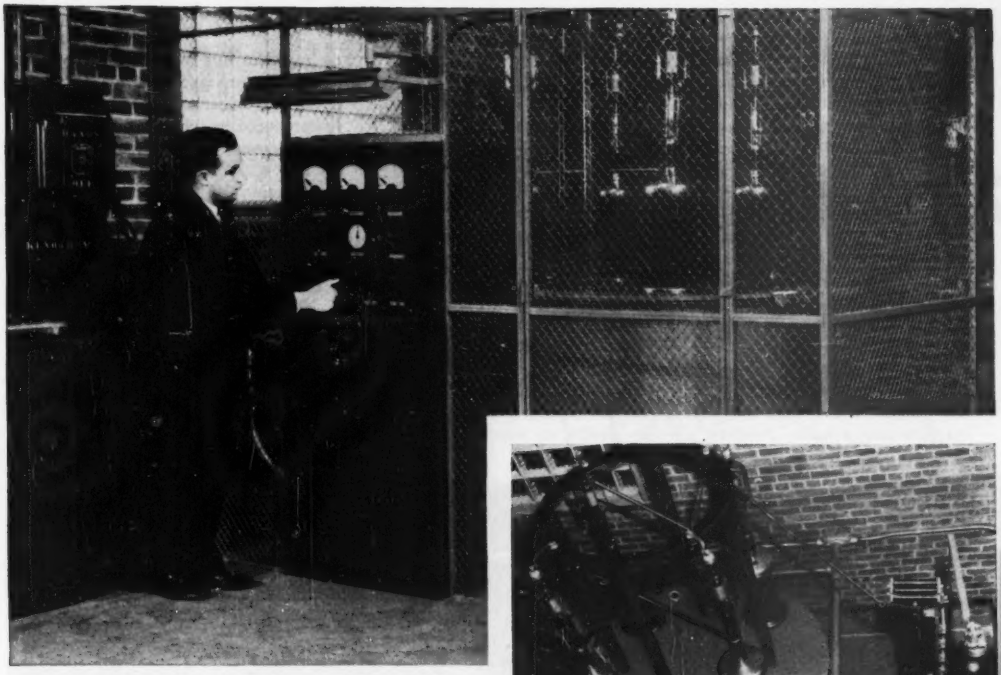
Reduction in the amount of solder used in making cable joint wipes has been accomplished by using the stick and torch method of solder application. In this method the solder is applied directly from solder bar to stick and formed into a small fillet type wipe, as distinguished from the larger ball type wipe resulting when solder is poured from a pot of hot solder and

H. L. PEDLEY, Engineer,
Line Design Division,
Engineering Department,
Commonwealth Edison Co, Chicago

formed into a wipe after the parts have been heated enough to "tin" properly.

Wiping solder used is a low-tin-content type. It contains nominally 30% tin, 2% antimony, 1¼% silver and 66¾% lead. The solder is used for wiping bond wires and copper joint casings as well as lead joint casings.

Solder by the stick-and-torch method is applied in this manner: After dressing in the pretinned end of lead casing or installing a lead wedge between the sheath and copper casings, the operator (a) cleans the adja-



Rochester Gas & Electric's newest kenotron is this 125-kv test set installed at terminal station No. 29 on its new 34.5-kv underground cable system.

R. G. & E. purchases 125-kv cable test set as a result of earlier experience

For almost 25 years, Rochester Gas & Electric Corp. of Rochester, N. Y., has used a 50/100-kv G-E kenotron test set on its 11-kv underground cable system, and has recently purchased an additional kenotron for testing cable on its new 34.5-kv system.

General Electric d-c cable test sets improve continuity of service by detecting cable faults before they occur. Thus, emergency calls are avoided and repair crew operations can be scheduled when loads are off peak. Also, repair materials can be purchased far enough in advance to avoid being "caught short."

D-c cable testing causes no deterioration of cable insulation. For details on the many other advantages of d-c testing with G-E kenotron sets and for useful application data, call your nearest G.E. representative or write to Section 401-91, General Electric Company, Schenectady 5, N. Y.

Cable testing equipment can be included in specifications for a complete cable installation—at a cost that is almost insignificant in the total outlay.

It will pay you to include this equipment. You will have it when you need it—beginning with the acceptance tests, and continuing through periodic testing during the entire life of the system.

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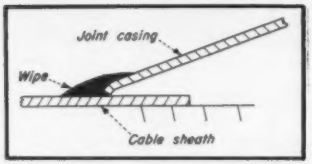
cent surfaces of sleeve and sheath by heating and applying stearic acid, and wiping off excess flux; (b) applies a small quantity of solder by heating the bar of solder and the surfaces to be soldered simultaneously and rubbing dabs of the softened solder onto the junction of sheath and sleeve, or between casing halves; (c) heats and works this solder into the junction of the parts being joined all around; (d) repeats the solder application by depositing and finishing enough solder to form a neat fillet of solder.

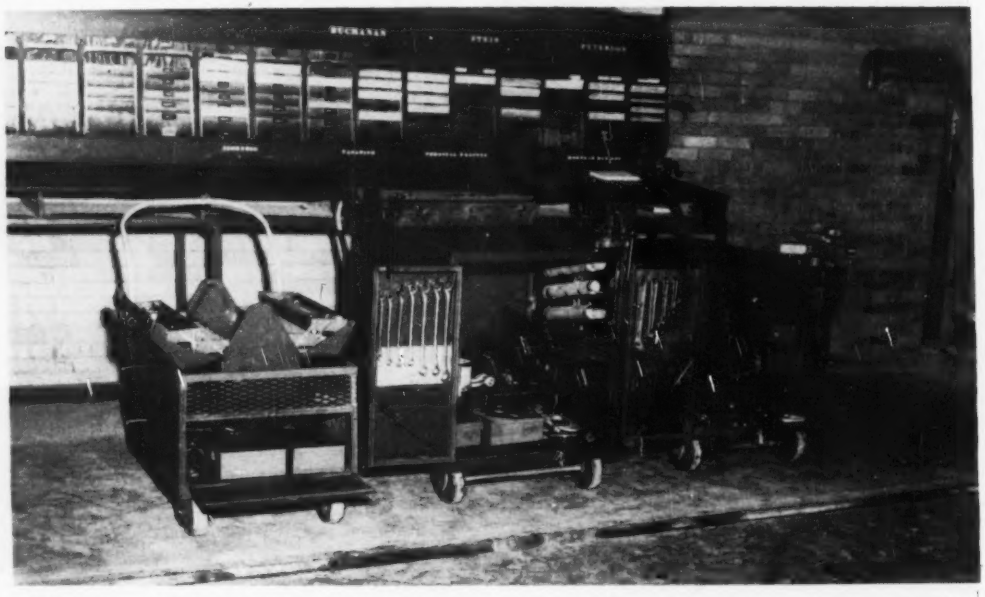
Air pressure tests on all wipes except those on small straight joints in low tension cables have revealed a very low rate of leaks. Available records indicate that the incidence of leaks is much lower than was the case with the earlier poured-type wipes.



FILLET-TYPE WIPE applied by stick and torch produces joints of better quality

Wipes made by this method require approximately 25% of the solder used in the former ball-type wipes. From a quality of wipe standpoint, wipes made in this manner are considered to be more uniform since no changes in the solder metal composition are produced by reheating or overheating.

Construction people prefer the stick-and-torch method of solder application. It takes less time to train the spicers in both application and finishing of the solder. Because of the smaller quantities of metal used and its direct application, wipes are more easily made in restricted locations. Possibility of "sags," where the mass of solder drops away from the bottom of a heavily poured wipe, is largely eliminated. Short ends of bars of solder used in making wipes are used up in the sweat solder pot.



TOOL CRIBS are built in three sizes to expedite maintenance work. Cribs are stocked with almost every tool which ordinarily would be used for maintenance, from center punch to chain hoist. Cribs have roller bearings and rubber tires

Mobile Cribs Solve Tool-Handling Problems

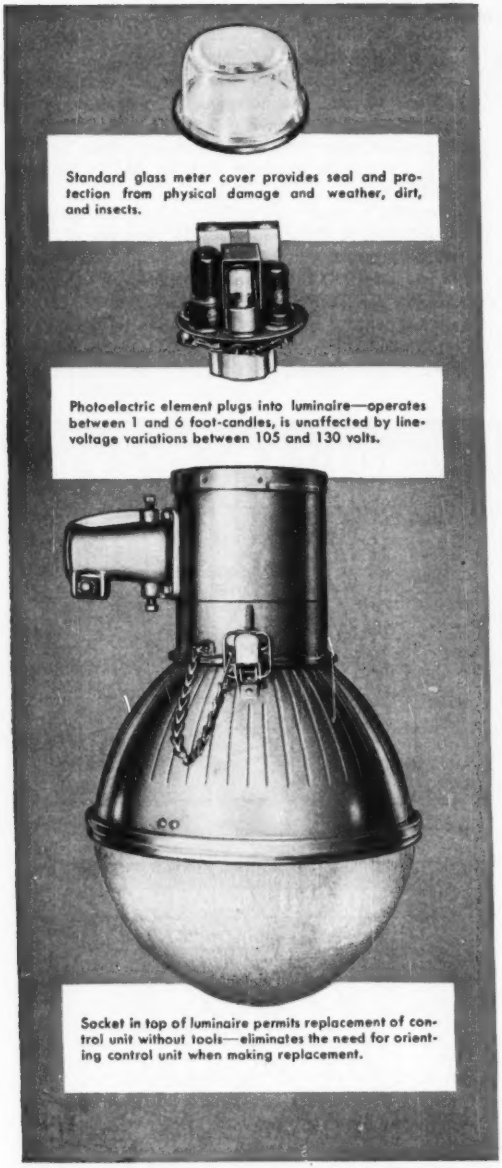
A. L. SMITH
Maintenance Supervisor
Philip Sporn Plant
Central Operating Co
New Haven, West Virginia

The mobile tool cribs illustrated save many man-hours by minimizing the waiting-time for tools and expediting their delivery on the job where needed. Hence they aid productive work, reduce maintenance expenses, and expedite the maintenance program.

The cribs carry almost any tool which is ordinarily used on a maintenance job, from a center punch to a chain hoist. Each crib carries a small tool-box for storing calipers, dividers, center punches, wrenches, screwdrivers, scrapers, a pocket knife, and other small tools. Large cribs also carry a small combination machine-and-pipe vise.

When a maintenance man is assigned a job, he takes the specific crib needed for that job. If the maintenance foreman feels that the man may not know which crib should be taken, the foreman may indicate on the job order the particular crib to use.

For Outlying Areas using multiple circuits


Standard glass meter cover provides seal and protection from physical damage and weather, dirt, and insects.
Photoelectric element plugs into luminaire—operates between 1 and 6 foot-candles, is unaffected by line-voltage variations between 105 and 130 volts.
Socket in top of luminaire permits replacement of control unit without tools—eliminates the need for orienting control unit when making replacement.

Photoelectric Luminaire Form 110

The Form 110 luminaire is the simplest way of controlling street lighting from multiple circuits. It is especially suitable for isolated installations beyond the reach of existing street-lighting circuits. Safety and adequate lighting are thereby provided where more extensive facilities could not be justified.

In the General Electric Form 110 luminaire, you have one compact, easy-to-install, easy-to-maintain unit. The Form 110 luminaire is operated by a photoelectric relay containing a sensitive phototube, two amplifier tubes for high amplification, and a tough load relay. All elements of this unit operate well below rated values for extra-long service.

After power failure the G-E Form 110 luminaire continues to operate the way you set it—and it's good for years of operation without adjustments. If it should fail, the control unit turns the luminaire ON, not OFF.

For a new idea in savings, look into the G-E Form 110 luminaire. Contact your nearest G-E office, or write for Bulletin GEC-395, General Electric Co., Schenectady 5, N. Y.

Type P Photoelectric Control for pole or cross-arm mounting.

Reflector support for Types CR or CS optical assemblies is die-cast aluminum, clamped to lugs on the hood.

GENERAL ELECTRIC

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How to Estimate Outage Probability Due to

Curves developed for estimating transmission line performance and insulation

Curves in Fig 1 to 8 apply for strokes to the tower and curves in Fig 9 and 10 apply for strokes to midspan.

Number of equivalent insulators is based upon 10-in. diameter, 5¾-in. spaced units. Outage probability is based on an isoceraunic level of 30 thunderstorm days per year.

Example—A 138-kv steel-tower line, shielded by an overhead ground wire, located in territory with an isoceraunic level of 50, has ten 5¾-in. spaced insulators per string. Average span is 1,000 ft; midspan clearance is 24 ft. Tower footing resistances are 10 ohms for 20% of towers and 20 ohms for 80% of towers.

What is the outage probability for this line?

Adapted from a paper "A Method of Estimating Lightning Performance of Transmission Lines" prepared by AIEE Working Group of the AIEE Lightning and Insulator Committee and presented at American Institute of Electrical Engineers, Pacific General Meeting, Pasadena, Calif.

From Fig 5, outage probability for 10 ohms and 10 insulators is 0.7 outage per 100 miles per year. For 20 ohms and 10 insulators, outage is 2.8. Combined probability for strokes to tower is (0.7 x 0.2) + (2.8 x 0.8) = 2.38 per 100 miles per year. Permissible stroke currents for the 10 and 20 ohms are 124,000 and 79,000 amp respectively.

From Fig 9, outage probability is 0.6 per 100 miles per year for 1000-ft spans with midspan clearance of 24 ft. Permissible stroke current is 128,000 amp. Average of 2.38 and 0.6 is 1.49 for an isoceraunic level of 30. Outage probability for the given isoceraunic level of 50 is 50/30 times 1.49 or 2.48 outages per 100 miles per year. This computation assumes perfect shielding and would be increased to approximately 2.65 for 0.1% shielding failures.

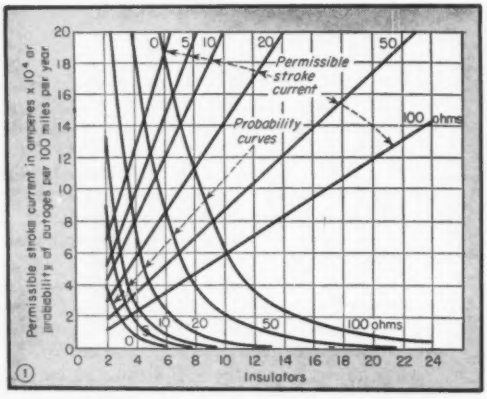


FIG 1—200 ft span

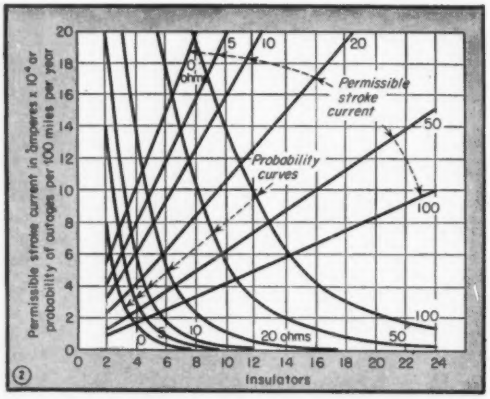


FIG 2—400 ft span

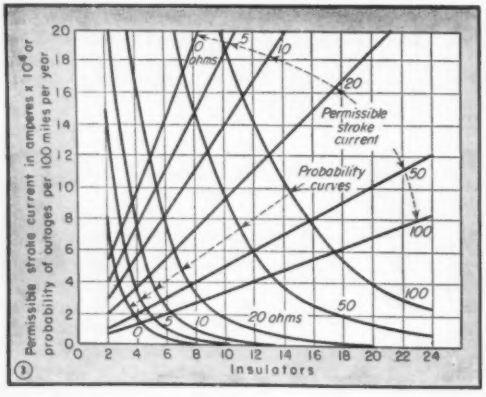


FIG 3—600 ft span

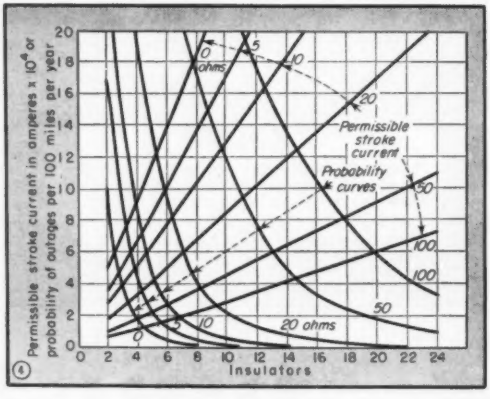


FIG 4—800 ft span

Lightning on a Transmission Line

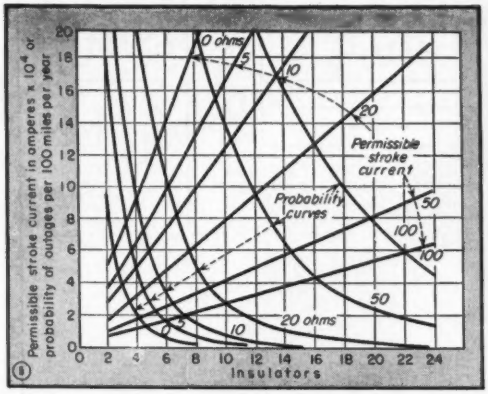


FIG 5—1000 ft span

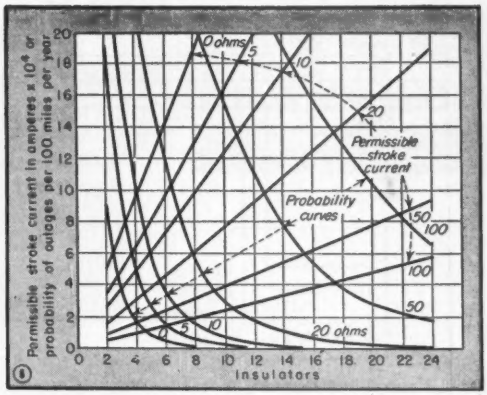


FIG 6—1200 ft span

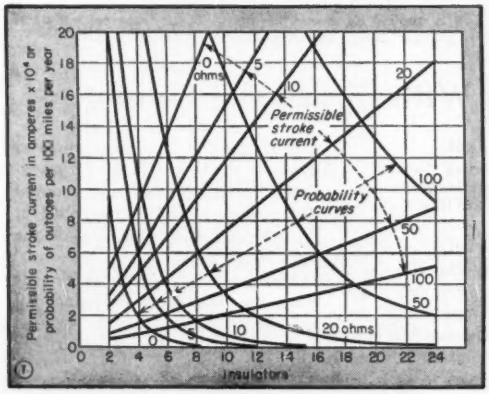


FIG 7—1600 ft span

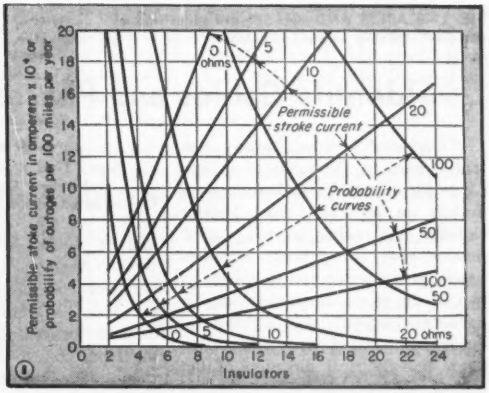


FIG 8—2000 ft span

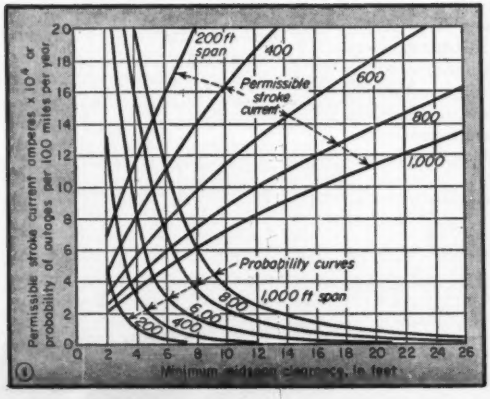


FIG 9—200, 400, 600, 800 and 1,000 ft spans and 0 to 100 ohms tower footing resistance

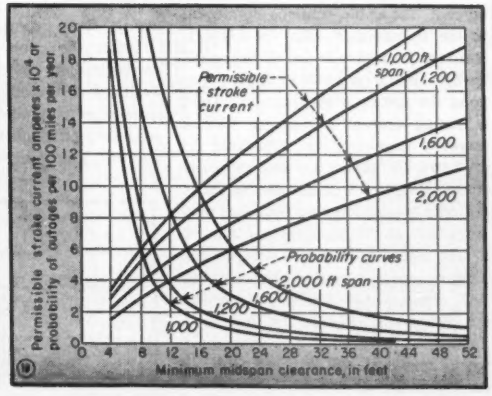


FIG 10—1000, 1200, 1600 and 2000 ft spans and 0 to 100 ohms tower footing resistance

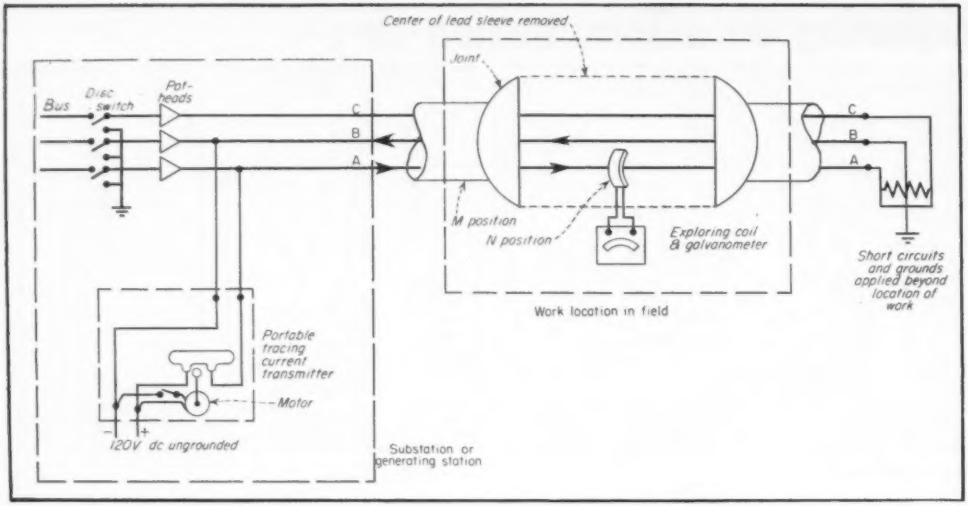


FIG 1—CABLES AND PHASES are identified by "directional impulse" tracing current, exploring coil, and galvanometer. Coil is applied on circumference at M to trace cables; at N for phases. Meter deflections identify desired cable

Identify Cables and Phases With Directional Current

F. B. KARGL
Supt., Field Operation Division
Substation Operation Dept
Consolidated Edison Co of New York, Inc

"Directional impulse" tracing current is used by Consolidated Edison Co to identify cables and phase conductors on 3-kv to 132-kv 3-phase circuits. The tracing current, a continuous series of periodic impulses (interrupted direct current), is sent on two of the phase conductors and in opposite directions. For phase conductor identification, it is essential to know the electrical direction of the tracing current source with respect to the work location.

In the application of this tracing current, the cable remains connected to the transformer. But the cable is removed from service and de-energized and an initial ground is applied beyond the test or work location. Then a tracing current transmitter with a mercury contactor is connected to "A" and "B" phase conductors at the station (Fig 1). A continuous series of periodic tracing current impulses at a frequency of 30 impulses per minute is sent over "A" and "B" phase conductors; positive periodic impulses on "A" phase; negative periodic impulse on "B" phase (Fig 2). A polarized arc-shaped exploring coil connected to a zero-centered galvanometer is used for the identification tests.

Exploring coil is moved at short distances on the cable circumference and the galvanometer deflection is observed. A satisfactory identification is obtained when (1) positive deflections are observed around one-half of the cable, the deflections gradually increasing from zero to a maximum value, then gradually decreasing to zero; (2) negative deflections are observed around the other half of the cable, increasing from zero to a maximum value, then decreasing to zero.

After the cable identification test is completed, a certification tag is fastened to the cable. Next the cable conductor is grounded at the station and the tracing current transmitter removed. The joint filling compound is then removed to allow the insulated conductors to be spread apart if necessary. Station grounds are removed and tracing current is re-applied at the station for identification of the phase conductors.

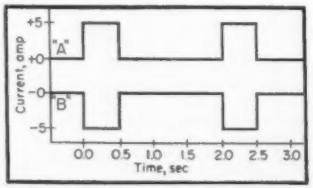


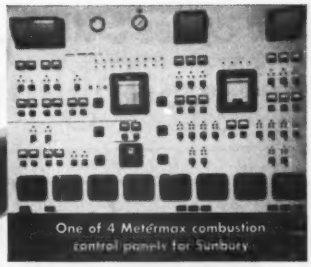
FIG 2—WAVE FORMS of tracing current are generated by a motor-driven cam and mercury tube contactor

Phase conductor identification is made by placing the exploring coil on each conductor in turn, with the polarity mark of the coil facing the source of the tracing current. When the coil is placed on "A" phase conductor, a continuous series of positive periodic deflections is observed on the galvanometer; with the coil on "B" phase conductor, a continuous series of negative periodic deflections is observed; and when the coil is placed on "C" phase conductor no deflections are observed. The conductors are then identified and marked to designate the respective phases.

In the case of a feeder circuit consisting of three single cables, phase identification is combined with the cable identification. The phases are identified exactly as when the conductors are exposed within a 3-conductor joint.

Two other identification methods, one using "continual action" tracing current, and another using "individual action" tracing current, will be outlined in subsequent issues.

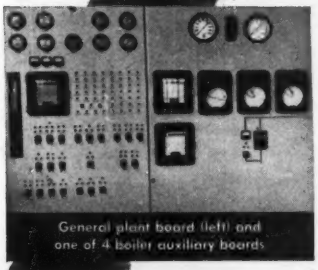
Central Control for Sunbury Engineered and Built by L&N



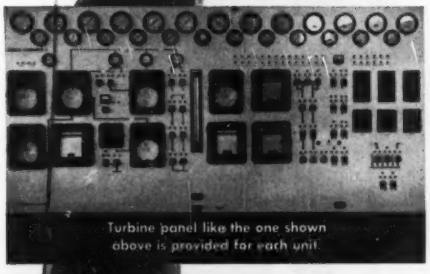
One of 4 Metermax combustion control panels for Sunbury

One of 2 generator panels

Desuperheater control board



General plant board (left) and one of 4 boiler auxiliary boards



Turbine panel like the one shown above is provided for each unit

The new Sunbury station of Pennsylvania Power & Light Co. strikingly demonstrates the value of centralizing boiler and turbine control for maximum convenience and minimum operating personnel. L&N specialists translated PP&L control requirements into a finished design. Involved are 20 panels, totalling 157 front feet, with over 900 instruments, switches, controllers, signals and accessories located in convenient operating sequence for coordinated control of four boilers and two turbines.

12,000 Man-Hours of Panel Engineering

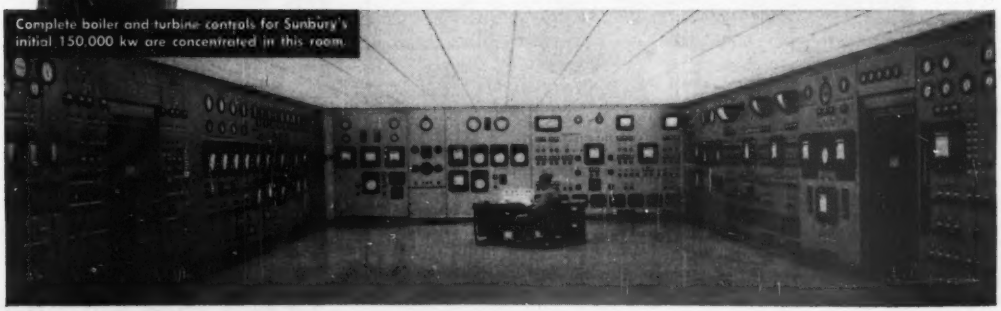
Over 12,000 man-hours of L&N engineering time were required. Panels were assembled in the L&N shop and shipped to the site fully wired, piped and tested. Similar L&N-designed control is being provided for the third and fourth units at Sunbury.

If you're planning a new station or adding to capacity, L&N control room design can save many man-hours of your engineering and on-the-site construction time. We'll be glad to send you our folder showing detailed panel layouts of central control rooms which we have recently supplied.

Write to our nearest office, or to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

34 Ad M-4607(7)



Complete boiler and turbine controls for Sunbury's initial 150,000 kw are concentrated in this room

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

A new line of "CSP" Transformers, with wall-mounted, high-voltage bushings and "De-ion*" arresters. Easier to install, with improved pole clearance. New, extra-strength bushings have large unbreakable "Enrup*" knobs for fast, positive hand-tightening of leads. Convenient location of arresters and brackets facilitates adaptation to wye or delta systems.

*TM Reg. U. S. Rubber Co.

Eliminates 80%

of your service calls

Here's how a large midwest utility credits "CSP®" (Completely Self-Protecting) Transformers with greater savings . . . better personnel relations, too, because they alleviated a costly problem:

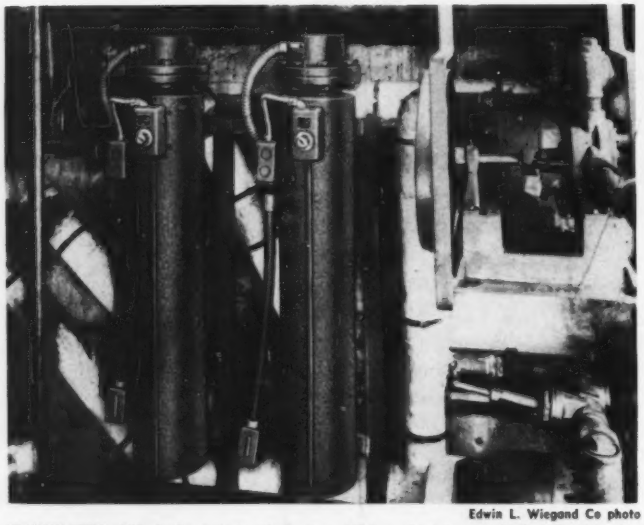
> "No one liked the necessity of calling out a full crew in the middle of the night to restore service on a conventional transformer because of a simple fuse outage. *'Midnight Nuisance'* is the term we applied. Our linemen used even stronger language.
>
> "Now, 'CSP' Transformers give ample warning of overload conditions. The Emergency Control provides reserve capacity to forestall outages until change-outs are convenient. Since we've standardized on 'CSP' Transformers, we've practically eliminated the *'Midnight Nuisance'*.
>
> "Our line crews prefer their greater freedom from emergency calls . . . and our comptroller appreciates the savings!"

One sure fact stands out: "CSP" Transformers cut service costs . . .

Get the full story on how Westinghouse "CSP" Transformers, with built-in lightning and thermal protection, can cut distribution costs for you. Ask your Westinghouse representative for a copy of booklet B-4249-A, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, 30, Penna.

J-70568

Fuel Oil Costs Cut With Electric Preheaters



Edwin L. Wiegand Co photo

HEAVY FUEL OIL is heated in these two 10-kw electric circulation heaters for easy pumping and efficient combustion. Fuel oil savings have quickly paid complete cost of installing these heaters. Electric preheaters are maintenance-free

Electric preheaters and burner reservoir heaters permit heavier lower-cost grades of fuel oil to be used at the Polk Sanitary Milk Co, Indianapolis, Ind. These heaters have quickly paid for themselves in fuel oil savings. Two 10-kw circulation heaters are installed at the oil storage tank which feeds two 225-hp boilers. Two burners on each boiler require 55 gal of oil per hour. One of these heaters operates 24 hr daily, 7 days a week. The second heater cuts in and out automatically as needed.

Pumping rate and outside temperatures determine whether either or both heaters operate; built-in thermostatic control prevents under- or over-heating the oil.

The preheated oil flows easily to the burners where it is again heated by low-wattage cartridge heaters in the burner reservoirs. Electric heat was chosen for its instant availability, simplicity of control, inexpensive operation, and freedom from maintenance.

Motor-Driven Pump Brings Phoenix More Water

General Electric Co photo

BOOSTER PUMP, powered by 800-hp motor, has stepped up water supply of Phoenix, Ariz., by 20,000,000 gal daily at a fraction of cost and amount of critical material of installing new pipeline of same capacity

A daily increase of 20,000,000 gal of water has been made possible through the use of an electrically-driven booster pump at Phoenix, Ariz.

Installation cost was about $70,000—a fraction of the estimated $400,000 cost (not to mention the critical material involved) of a new pipeline with the same capacity, according to R. Gail Baker, Phoenix city engineer.

The booster station used an 800-hp motor to drive the pump. A 5-hp motor operates a valve which connects the pump to a 48-in. main.

Because of the 11,000 increase in the number of water customers during the past year, the booster station was needed to step up the city's daily capacity. The pump has a peak capacity of 50,000 gal per min or 72,000,000 gal per day.

INDUSTRIAL BRIEFS

Bus loop having 1500 amp capacity reduces voltage drop and simplifies wiring at the Westinghouse Beaver, Pa., works. Loop feeds 18 resistance welders ranging from 10–75 kva. Welder supply cable runs from tap box in nearest corner of loop and is fed from a 480-kva, 2300/230-v transformer.

Diesel switch engines which stand idle overnight on an open side track in the Kingsport, Tenn. yards of the Clinchfield Railroad are kept warm and ready for quick starting by immersion heaters installed in their cooling systems. Thermostatically controlled heaters totaling 12 kw are installed in each engine. Circulating pump operates when heaters are on. Despite near-zero temperatures use of antifreeze is unnecessary. Plug-in stations are spotted alongside track at convenient locations. Three switch engines are used with total connected load of 36 kw. J. E. Faust, Power Sales Engineer, Kingsport Utilities, Inc.

Replacing an 18-hp steam turbine with a 15-hp electric motor at the Case Fibre Co, Andover, Conn., saved $200 per month. Cost of the change to purchased power was liquidated in five months. Exhaust from turbine had been piped to heating coils in paper dry loft, while turbine had driven fans there. Exhaust exceeded low-pressure steam needs of that section, especially in summer. With replacement of the turbine by a motor, exhaust of another steam unit was utilized.

Electric steam boiler saves time in getting steam up to operating pressure for making pellets for livestock and poultry at the Brundidge Milling Co, Brundidge, Alabama. Only 15 to 20 min is required in the morning to start operating and steam pressure stays the same all day. Laying pellets are turned out at rate of 3½ to 4 tons per hr and 40% hog supplement pellets on ½ holes—4 to 4½ tons per hr. Demand for pellets is forcing company to purchase another electric boiler. Livingstone Engineering Co, Worcester, Mass.

Infrared Oven Cuts Paint Drying Costs

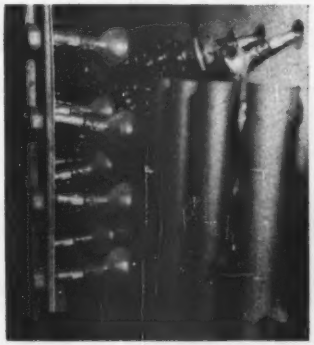
S. BURCK
Industrial Engineer
New Jersey Power & Light Company
Dover, N. J.

Paint drying in an infra-red oven for rocket shell containers has saved time and floor space for Standard Container, Inc, Rockaway, N. J. Installation and maintenance cost was low. Entire baking cycle is about 1½ min but flexibility of design permits possible changes if required. Uniform heat eliminates rejects on rigid Government inspection tests for olive-drab finish.

The oven is made up of eight panels, of which seven are 8 ft long and approximately 4½ ft high, and one panel is 7 ft 4 in. long. These panels were made up by the customer and consist of asbestos board mounted on plywood. Each panel has 32 lamps, four horizontal rows and eight vertical rows. The total number of lamps for the entire oven is 252.

The oven has 500-w, 375-w, and 250-w infrared lamps making a total connected load of approximately 100 kw. Each panel was wired so as to utilize different phases of the three phase system, and thus permits a balanced load. No attempt has been made to insulate the oven against any possible convected heat losses.

At the beginning of one end of the horseshoe-shaped oven the shell containers are sprayed. The photo shows the containers as they enter one side



SHELL CONTAINERS are dried in 1½ min in this 100-kw infrared horseshoe-shaped oven after spray painting. Uniform heat eliminates rejects on rigid government inspection tests for olive-drab finish specified

of the horseshoe just following the spray operation. No provision has been made to rotate the containers while passing through the conveyorized oven since the lamps give complete coverage and a thorough drying job.

Above the oven, a hood and exhaust fan are used to remove some of the fumes and moisture. At the other end of the horseshoe, where the containers come out of the oven, there is a cooling zone which is cooled by a large fan. This permits the workers to handle the containers as soon as they come out of the oven, and thus avoids any possible bottlenecks.

Speeding Service

(*Continued from page* 82)

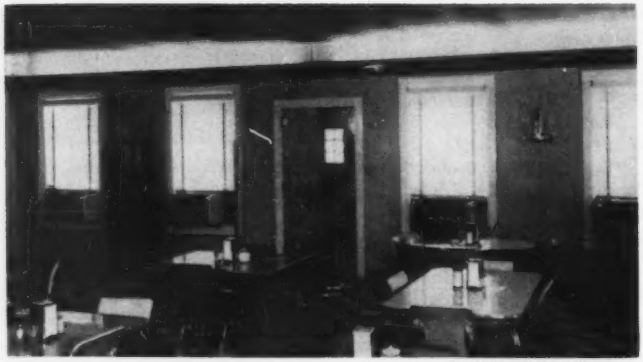
used for some other purpose.

In the selection of the 4,160-v control equipment, the customer brought the manufacturer to our office to consult with our engineers to make sure that relays and other protective devices would be properly selected and correlated with our facilities. The 4,160-v breakers were selected with interrupting capacity that would ultimately be desirable. Construction was undertaken at a time when materials were scarce and deliveries long. The customer had no resources of supplies and equipment to fall back upon and in a number of instances called upon us for help. When he couldn't find cable for his incoming line, we sold him some from our stock. Delivery of his unit substation was delayed and to get the plant in operation at the earliest date, we reconnected an old rotary transformer from our railway system and moved it into the plant, dug an old oil breaker out of the storeroom for an incoming switch. Production started months earlier than would otherwise have been the case. Of course, we put ourselves out to do these things, which could be considered outside the realm of supplying power to an industry, but when we add up the results, it is obvious that we can't afford to do business on any other basis.

SALES AND SERVICE

RESIDENTIAL • RURAL
COMMERCIAL

Small Units Handle Big Air Conditioning Job



Frigidaire Division, GMC, photo

WINDOW-TYPE air conditioners keep restaurant in Del Rio, Texas, comfortable despite hot Texas sun. Lack of cooling water ruled out use of large single unit

Although the window-type room air conditioner was primarily designed for homes, offices, and other comparatively small spaces, it seems likely that these small package units may find larger application. An example is the Home Plate Cafe in Del Rio, Texas, where five window air conditioners serve a dining area of 1,848 sq ft with 9-ft ceiling, keeping it comfortably cool despite the hot Texas sun. Considering the climate, a space of this size would require 5 tons of refrigeration.

But it was found impracticable to supply cooling water for a unit of this size. It was decided to see what could be done with the air-cooled window units, and 5 of one-ton size were installed.

The restaurant operator reports they are turning in a top-level performance. During the first 90 days of operation, advised and aided by the local dealer, he experimented to determine most effective use. He found that by turning on the units early in the morning he could obtain a shorter cooling down period.

Venetian blinds on the sunny side of the building help reduce the heat load. The conditioners reduce the temperature from 95 degrees to 83 degrees in a single hour. Lights in the restaurant are not usually turned on until 6 or 7 p.m. During the evening hours, only 4 of the units are required. At a recent dinner which took place at 8 p.m., 54 guests remained comfortably cool for two hours with all fresh air ducts closed for 60 minutes. Normal operation calls for introduction of 20% fresh air into the dining room space.

Mass Selling Gets Results for Florida Utility

J. H. KEELE
Florida Power & Light Co
Miami, Fla

Ranges, 92%; water heaters, 161%; refrigerators, 53%. That's the record of increases, 1950 over 1949, in sales of major kitchen appliances in the service area of the Florida Power & Light Co. Complete statement of sale of appliances is tabulated on page 104. It is easier to sell major appliances to new, than to old, customers, but the figures of sales per 1,000 customers in the table indicate that the sales methods employed, while more definitely directed towards new customers, were also effective in selling the old ones.

Mass selling is the technique used. Evidence of its effectiveness appears in the tabulation in figures of decreases in sales personnel and sales expense per customer and of increases in sales per 1,000 customers as between 1940 and 1950. The year 1940 is used for comparison because it was the nearest previous one in which the company engaged in full scale promotion.

The company does not sell or service appliances. These functions are the responsibility of the local trade. The company has a comprehensive dealer sales development program which includes an advertising program of wide scope, employing all available media; constant sales training for dealer personnel; promotional material on operating costs; periodic mass promotions to stimulate electric appliance sales; a qualified force of home economists available for demonstrations, cooking schools, and care-and-use instructions for new purchasers of electric appliances; a prospect lead system that really works; sales assistance in difficult competitive situations involving multiple sales; testimonial books, visualizers and other sales aids; and last but not least, an outstanding monthly publication which has become a regular trade journal for appliance dealers in the territory served.

Until about July, 1949, the company had been singularly unsuccessful in securing much electric business in multiple housing projects. Lack of adequate wiring, inclusion of gas equipment in the mortgage, scarcity

MORE AMPERES CAN RIDE THESE CABLES

You can do yourself and our country a service by installing Simplex-ANHYDREX XX Cables wherever you need to replace high voltage power cable.

Here's why. You can crowd more amps into the same size copper when it is insulated with Simplex-ANHYDREX XX. That's how you save copper. Of course your cables will run hotter but that's all right with Simplex-ANHYDREX XX insulation. This insulation is built to withstand 75°C. to 80°C. (167°F. to 176°F.), depending on operating conditions.

Simplex-ANHYDREX XX Insulated Cables can be used underground, directly in the earth, or in ducts, or they can be used overhead as aerial cables. The special Simplex neoprene jacket protects these insulated conductors from sunlight, oil, acids, alkalies, etc.

Want to know more about this versatile high temperature, high voltage power cable insulation that really combats moisture and water? Then return the coupon. No obligation, of course.

Simplex-ANHYDREX XX is a product of Simplex Research

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

of suitable electric appliances, were among the reasons for this situation. Therefore a definite promotional program was launched for this particular market. Trained company representatives contacted architects, builders, and owners prior to the construction of each new home building project, giving a complete presentation of the advantages of adequate wiring and electric kitchens and other appliances. Builders were encouraged to include major electric kitchen appliances as a part of the mortgage. The wholehearted assistance of 17 electrical wholesalers was secured, and as new prospects developed, complete information was given these 17 wholesalers, who, in turn, relayed the information to their dealers for sales follow-up. As the campaign went on, a unique advertising program was inaugurated by which various housing projects which had gone all-electric were featured, with resultant benefits to both the builder and the promoters of greater use of appliances.

As a result of this aggressive promotion, today practically all builders are providing for all-electric kitchens in their projects. It is interesting to note that while 30,000 new customers were added in 1950, 27,955 electric ranges and 19,732 electric water heaters were sold in the territory during the same period. The publicity due to this promotion has also been a definite stimulus to the installation of all-electric kitchens in many of the older homes in the territory.

An important activity during 1950 was continuation of an aggressive campaign for adequate wiring. A never-ending promotion, the fact that 80% of all homes constructed during 1950 in the area served were wired with 60-amp or larger service entrances is ample evidence of the effectiveness with which this program has been carried on.

The company's home service representatives played a vital role in the promotional program, not only in conducting mass cooking schools before more than 150,000 customers in 35 of the communities served, but also in conducting group demonstrations in dealer stores, and before women's organizations, working closely with county home demonstration agents, Girl Scout groups, and the home economics classes in the various schools and colleges. More than 250 electric ranges were installed on a year-to-year loan basis in 104 schools.

The constant month-after-month hitting away thru the various advertising media, the periodic special promotions carried on, the hard work and constant plugging of both company representatives and dealer sales people, the important missionary work of the home service representatives—all combined to make it possible for Florida Power & Light Co to win first place for electric kitchen promotion and second for electric range activity in the 1950 Hughes Awards.

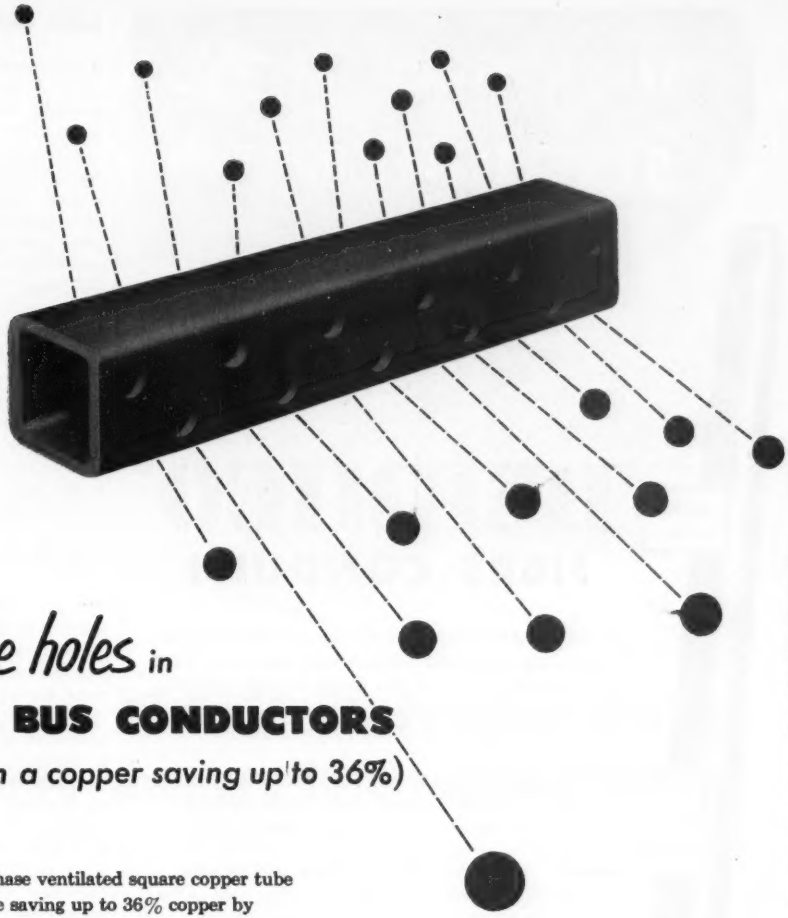
TABLE I—Major Kitchen Appliances Sold, 1949–1950
Florida Power & Light Co

	Sales		Increase		Sales/1,000 Residential Customers			
	1949	1950	Number	%	1949	1950	Increase	Increase %
Ranges	14,598	27,955	13,357	91.50	58.90	100.62	41.72	70.83
Water Heaters	7,564	19,732	12,168	161.00	30.52	71.02	40.50	132.70
Refrigerators	38,469	58,816	20,347	52.89	155.22	211.70	56.48	36.39

TABLE II—10-Year Record of Residential Business
Florida Power & Light Co

	Number		10-Year Increase	
	1940	1950	Number	%
Residential Customers (Average for Year)	115,103	277,830	162,727	141.56
Average Annual Kwhr per Residential Customer	1,381	2,201	820	59.38
Sales Personnel*	166	137	−29	−17.47
Customers per Sales Representative*	896	2,396	1,500	168.53
Sales Expense* per Customer, $	3.58	2.86	−0.72	−20.11
Ranges per 1,000 Residential Customers	247	389	142	58.3
Water Heaters per 1,000 Residential Customers	118	370	252	213.5
Refrigerators per 1,000 Residential Customers	643	839	196	21.2
All Three per 1,000† Residential Customers	118	276	158	133.9

* All customer classification, not residential only. † Customers with range, water heater and refrigerator.



Note the holes in

CHASE BUS CONDUCTORS

(they mean a copper saving up to 36%)

When you use Chase ventilated square copper tube conductors you're saving up to 36% copper by weight compared to using flat bars.

Chase square copper tube bus conductors have high thermal conductivity and low voltage drop and power loss per pound of metal. Ventilating holes aid in the dissipation of heat, increase the current-carrying capacity about 20% over unventilated tubes.

For full information about the characteristics of Chase square copper tube buses, fill out and send the coupon.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
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FREE Chase Bus Conductor Handbook gives physical and electrical characteristics and data on copper saving.

Chase Brass & Copper Co., Dept. EW 751
Waterbury 20, Conn.

Please send me the Chase Copper Bus Conductor Handbook.

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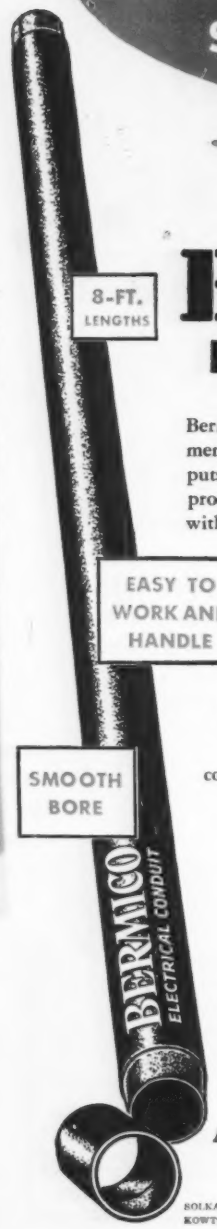
FOR CONDUIT *with the* STRENGTH BUILT-IN SPECIFY



8-FT. LENGTHS

BERMICO®
FIBRE CONDUIT!

Bermico has the strength to meet every conduit requirement — the all-around strength that only wood fibre puts into conduit! It is this tough, durable specially-processed fibre which makes Bermico better able to withstand excessive abuse and rough handling.

EASY TO WORK AND HANDLE

With Bermico you get **Easy Cable Pull.** Its unusually smooth bore prevents chafing or injury to cables being pulled through.

Bermico is **Easy to Work and Handle.** You can do cutting and tooling right on the job! Its 8-foot lengths are light . . . easy to install.

SMOOTH BORE

Bermico's **Complete Line of Bends,** plus angle couplings, enables you to meet unusual field conditions.

On your next construction job, use Bermico — the conduit with the strength built-in. It will give you extra years of trouble-free cable protection at lower cost.

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WESTINGHOUSE
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Offices in all leading cities

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SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWLS • BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

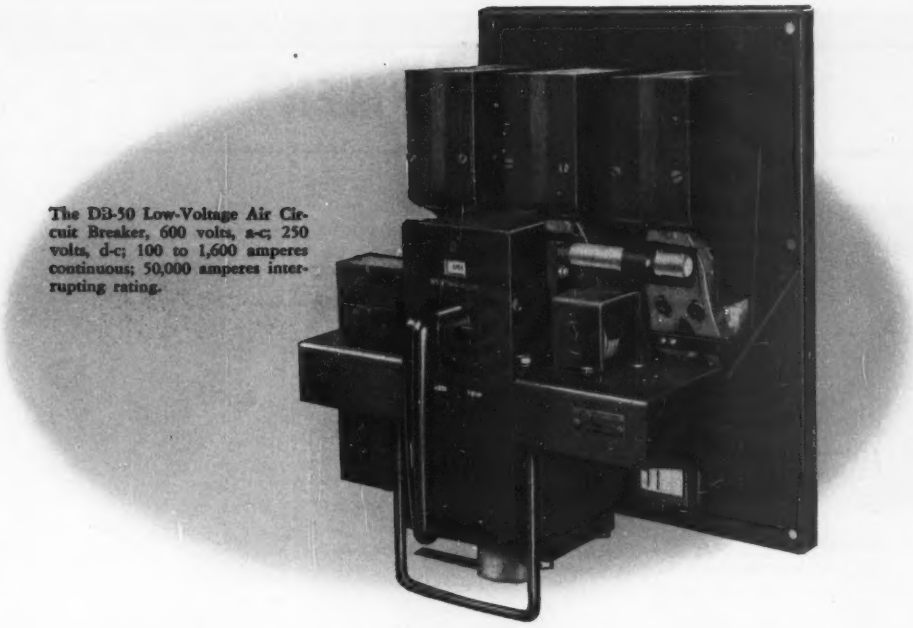
Sales and Service Notes

• In addition to the usual promotional activities of newspaper and radio advertising, window displays, etc, the Pennsylvania Electric Co used another way to keep dealers on their toes in a recent electric roaster campaign. It was the "Mystery Shopper," any one of a number of unidentified utility employees who might appear in any dealer's store at any time during the campaign. The salesperson making a satisfactory roaster presentation to the "Mystery Shopper" was awarded a Penelec prize certificate on the spot.

• Replacement of side-arm electric water heaters with 50-gal storage heaters is being offered free of cost up to $50 by Tacoma (Wash) City Light. The reason is not load building but recovery of system capacity for other uses. It is figured that each such replacement recovers 2 kw.

• A new "controlled humidity" roll warmer, using a unique air circulation system to protect bread flavor was introduced by Hotpoint, Inc, at the National Restaurant Association convention in Chicago recently. Moisture driven out of the bread by heat rises, is condensed on the stainless steel top, then runs down the inside walls to the dry heat well in the base of the appliance where it is evaporated and rises again through the bread. No water vapor is lost or gained by the circulation principle, even though rolls are held at a constant 125 degrees, it is claimed.

• What can we do to help you get laundry dryers? What can we do to help you sell them? Such was the approach of Union Electric Co of Missouri to one of the local distributors. Result was a consultation between the manufacturer, distributor and utility. In a campaign featuring 1,500-w, 120-v, plug-in dryers, the manufacturer is furnishing 350 units, the distributor and dealers are advertising them on a free-trial basis and the utility is paying delivery and pick-up charges which amount to $7 per unit. The power company is supporting the activity with spot radio announcements and the manufacturer with newspaper advertising. It is anticipated that dealers handling other makes of dryers will build up their stocks and profit from the promotion.



The DB-50 Low-Voltage Air Circuit Breaker, 600 volts, a-c; 250 volts, d-c; 100 to 1,600 amperes continuous; 50,000 amperes interrupting rating.

NOW...the PROVED DB Breaker Design in 50,000-Ampere Interrupting Rating

Here's the third member of the DB Air Circuit Breaker family. It's the new DB-50—a modern breaker that fulfills your need for higher interrupting capacity on low-voltage circuits.

Of the same uniform design as the DB-15 and DB-25, the DB-50 includes . . . complete shielding for extra safety . . . subassemblies that are removable as complete components . . . a rigid all-metal mounting base. General construction and operating characteristics are similar to the DB-15 and DB-25 breakers.

To match the improved performance offered by the new 50,000-ampere breaker, a series tripping device has been developed which provides all the basic delay characteristics required for motor circuit protection or for use in selective tripping systems. By use of filtered air as the escapement medium and by incorporating adjustable features to all pickup and delay settings, a tripping device has been provided which is both versatile in application and precise in operation.

Booklet B-4740 contains complete information on the DB-50. The DB-15 and DB-25 units are covered in B-4067. For copies, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60747

See "Electrical Proving Ground" . . . *the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse representative, or write Westinghouse, Film Division, Box 868, Pittsburgh 30, Pennsylvania.*

YOU CAN BE SURE... IF IT'S Westinghouse

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

"DE-ION" CIRCUIT BREAKERS

TYPE DB

NEW EQUIPMENT

Stud Driver

Cartridge powered, model 450 stud driver is reported capable of driving a steel stud through a ¾ in. steel plate into concrete with sufficient force to withstand a 4000 lb pull.

Features of the new tool are its low recoil, lack of explosive noise, and a firing pin indicator. A variety of studs and accessory fixtures are available for such jobs as attaching conduit to concrete or steel and corrugated sheets to steel or concrete building frames.

A number of safety devices provide the operator with protection from accidental injury.

Remington Arms Co, Bridgeport, Conn.

•

Electro-Luminescent Lamp

A new method of producing light employing thin flat sheets of glowing glass instead of bulbs or tubes has been introduced. This lamp consists of a special sheet of conductive glass on which is placed a phosphor-dielectric coating, and a layer of vaporized aluminum. Wires are connected to the edges of the sheet.

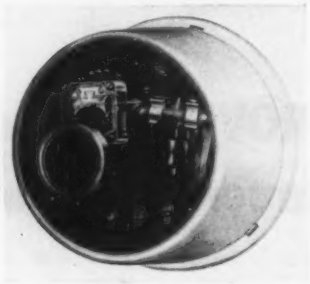
Commercial availability of Panelite is at present limited to two types. One presents a green luminosity of 1.0 footlambert at 120 volts, the second a green luminosity not over 2.0 footlamberts when a 500 volt step up is used. Both are for 60 cycle operation.

Sylvania Electric Products Inc, 1740 Broadway, New York, N. Y.

•

Illumination Control

This unit, mounted in a standard weatherproof watt-hour meter glass case, consists of dry-disk photocell,



relay which is operated directly by the photocell, clock motor, mercury switch, and limit control.

Completely automatic "on-off" control of artificial lighting at pre-determined light levels is provided.

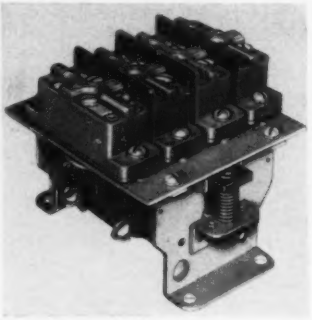
Installing Model 1089 requires only plugging it into a standard watt-hour meter receptacle.

Weston Electrical Instruments Corp, 641 Frelinghuysen Ave, Newark 5, N. J.

•

Four Pole Relay

Designated as a four pole relay, the Type PO 4 unit actually has four normally-open and four normally-closed contacts. This allows the circuit arrangement to be changed from normally-open to normally-closed merely by changing the incoming wires to different terminals. When used in circuits of same polarity, four normally-open and four normally-closed contacts are available.



The relay is rated at 10 amperes non-inductive, with inductive rating of five amperes at 600 volts, 15 amperes at 110 volts. Coils are available for 6 to 600 volts, 25 to 60 cycles.

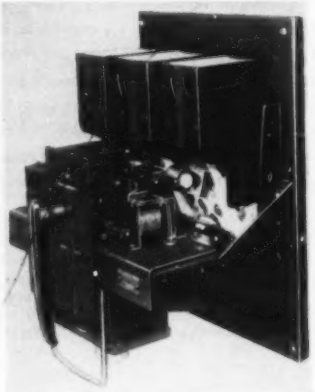
Square D Co, 4041 North Richards St, Milwaukee 12, Wis.

•

Low Voltage Air Breaker

Rated at 600-v ac and 250-v dc, a new unit the DB-50, has a continuous rating of 100 to 1600 amp and an interrupting capacity of 50,000 amp.

Application is in low voltage industrial and commercial power dis-



tribution systems, central station auxiliaries, motor starting, and similar uses. A new air delayed series overcurrent tripping device provides a

7 ADVANTAGES
all in one bracket
No. 23104
HUBBARD
1. Graceful simplicity—light weight—low cost.
2. Optional attachment to wood poles with 3 lag screws or crossarm bolt and lag screws.
3. Meets all current strength and design requirements.
4. Design permits maximum elevation of luminaire, threaded or slip-fitter style.
5. "Free-flowing" internal wiring —beveled pipe ends—no sharp bends—no obstructions.
6. Famous Hubbard Key-Hole feature . . . one man installation.
7. One piece construction throughout—permanently aligned at factory.
new LAG SCREW ATTACHMENT FOR WOOD POLES

HUBBARD UPSWEEP LIGHTING BRACKETS

HOT GALVANIZED

This popular member of the Hubbard Upsweep Bracket family meets a real need where wood poles are used and short brackets are adequate. Installation is easily made by one man. A ⅝-inch lag screw is turned into the pole, leaving about one-inch projection under the head. The famous Hubbard Key-Hole feature is incorporated in the upper mounting plate, which is welded to the bracket. The Key-Hole slot is dropped over the projecting lag just back of the head.

Final tightening of the ⅝-inch lag screw is accomplished with a wrench, working clearance for which is provided by the bracket's special design. The two bottom ½-inch lags are inserted, and the attachment is complete and secure. At the user's option greater strength may be obtained by substituting a ⅝-inch crossarm bolt for the ⅝-inch lag screw.

The above bracket is also currently available in Aluminum Alloy. Write for complete details.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

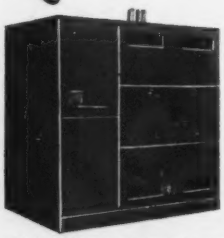
"Hang the Load on Hubbard Hardware!"

TYPE C

General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase

HIGH efficiency

MARCUS DRY TYPE transformers



450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø—120/208Y, 4 wire.

LOW maintenance

1500 KVA, Type F Unit Substation, 4800 V Delta 60 Cy, 3 Ø—120/208Y, 4 wire.

Years of specialization in the dry type transformer field have resulted in a far superior product. Being ahead of the rest of the field is the natural result of continuous effort and research in uncovering new materials which are your constant assurance of maximum transformer value.

MARCUS DRY TYPE, AIR-COOLED TRANSFORMERS

ARE SAFE — No explosion or fire hazards. No fire proof vaults. Class B and C heat proof insulations.

ARE ECONOMICAL — Lower cost installation and operation, negligible maintenance.

For the transformer that's second to none, specify MARCUS.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

NEMA

Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

MTC

MARCUS TRANSFORMER CO. INC.

30 MONTGOMERY STREET

HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

long delay on overloads and instantaneous tripping of fault currents. Overcurrent trip units including both a long and short delay element can be specified for use on feeder and back-up breakers, providing for selective operation on fault.

All parts are removable as complete pieces. Operation is either manual or by either dc solenoid or ac Rectox solenoid.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

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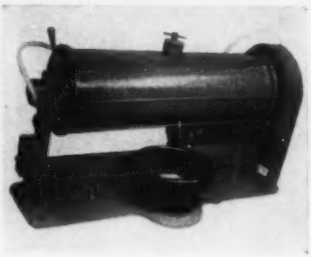

Mercury Cleaner

Designed to remove dissolved base metals and eliminate floating impurities this new cleaning unit is reported capable of handling 600 lb a day.

An electric motor powers a set of paddles which beat the mercury and whip it into a thick spray. As base metal contaminants come in contact with the air, they oxidize and form a powder which is removed by filtering.

Bethlehem Apparatus Co, Hellertown, Pa.

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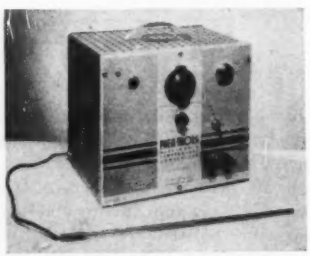
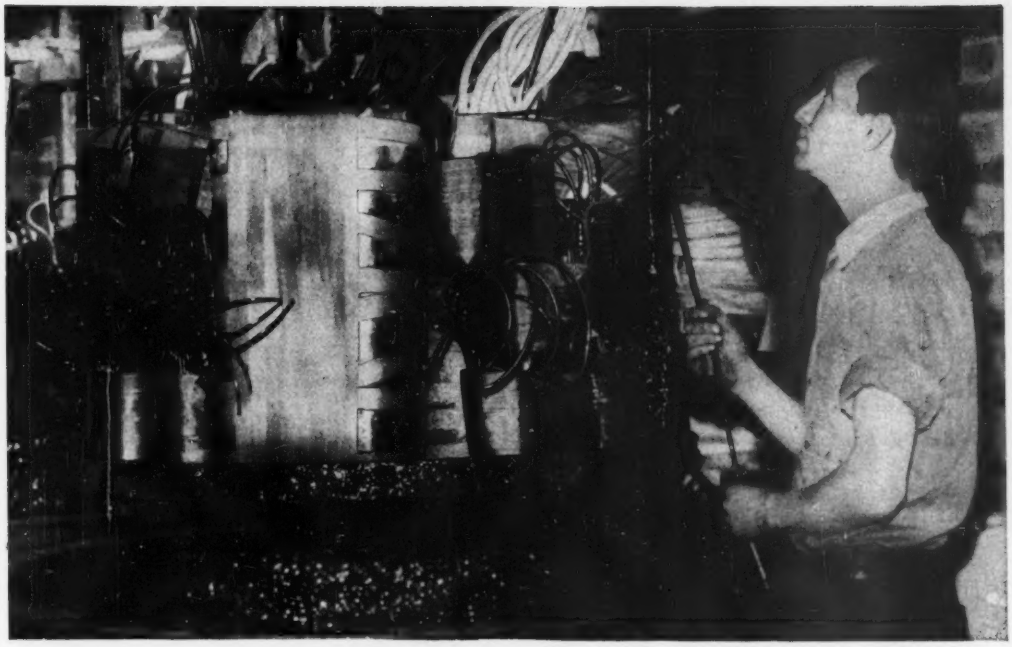


Temperature Controller

Rugged, and reportedly highly sensitive, the Phen-Trol controller has been designed for use in laboratories and industry with heated molds, immersion heaters, liquid baths, ovens, etc.

This unit is said to be capable of handling loads up to 3,000 watts and maintaining preselected temperatures



Marcus Transformer Co. has used HARVEL 912-C for years . . . "FOR TOP-QUALITY INSULATION AT MODERATE COST"

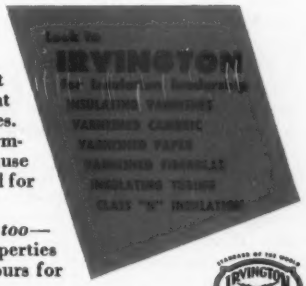
A consistent user of Harvel Internal Curing Varnishes ever since 1936, Marcus Transformer Co., Hillside, N. J.—one of the world's largest manufacturers of dry type transformers—naturally investigated Harvel 912-C as soon as Irvington Varnish & Insulator Company placed this product on the market.

Result: Marcus has been using 912-C ever since—to the complete satisfaction of Marcus *and Marcus customers.*

Reasons: Harvel 912-C bonds conductors firmly into a solid, compact mass—has a dielectric strength of 2200 vpm—*retains* its excellent mechanical and electrical properties even at elevated temperatures.

Other advantages: Harvel 912-C gives equally outstanding performance in other types of transformers or in rotating machinery—because it is completely oilproof . . . free from soft, tacky interiors . . . ideal for high peripheral speeds.

You can get all these features—and speed up your production *too*—when you use Harvel 912-C. In many cases, its fast curing properties cut baking time in half! The full story on Harvel 912-C is yours for the asking—just fill out the coupon below.



Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

EWD-7/51

Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N. J.

Gentlemen:

Please send me technical literature on Harvel 912-C Internal Curing Insulating Varnish.

Name.....

Company.....

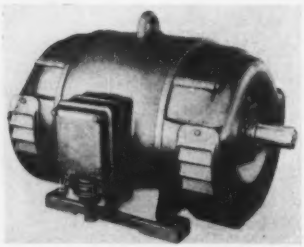
Street.....

City.....Zone.....State.....

within 0.50 C. A stainless steel thermocouple actuates the unit when connected to heating device.

Phen-Trols Inc, 15 Franklin Place, Rutherford, N. J.

•



Motor & Brake

Quick-Stop motor, a combination brake and drive, is designed for use where frequent starts and stops are required.

Special controls are not needed for applying or releasing the brake. When power is cut this unit brakes and stops with 150% of normal torque.

Available in 0.3 to 8 hp drip-proof and .2 to 4 hp totally enclosed.

Brown Boveri Corp, 19 Rector St, New York 6, N. Y.

•

Part Winding Starter

A new a-c part winding starter has been developed for use with motors which employ two separate parallel windings, star or delta, to obtain increment starting.

This unit consists of two A-B across the line starters and a pneumatic timing mechanism mounted below one starter and operated by the starters solenoid plunger.

Pressing the start button immediately closes the first starter which energizes one of the two parallel windings. After a few seconds the timer energizes the second starter, supplying full line current to both windings.

Allen-Bradley Co., Milwaukee 4, Wis.

•

Fluorescent Fixture

Because of their shallowness (only 4½ in.) the 9300 series of surface attached luminaires are said to simulate recessed construction without the expense of roughing in.

Two or four fluorescent lamps (4-ft or 8-ft in length) of either the conventional bypin or the new instant start single pin type can be used.

Construction of these units permits easy removal of the Controlens and includes snap shut hinged doors.

Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

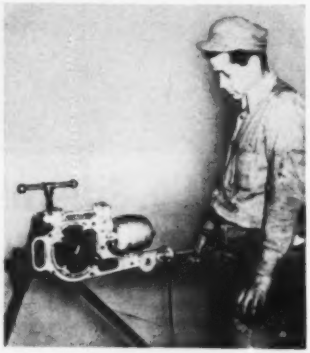
•

Plating Rectifier

A new unit, reported to be the largest single unit selenium rectifier ever built, has a rated capacity of 13,000 amperes at 14 volts.

This rectifier is automatically controlled by means of saturable reactors and electronic circuits to maintain constant voltage.

Bart-Messing Corp, Belleville, N. J.



Power Pipe Threader

Pipe ranging in size from ¼-in. to 4-in. can be threaded on the job with the Port-A-Pony portable power pipe threader.

The manufacturer reports that all popular types of die stocks are adaptable to this unit. A ½ hp, 110 volt a-c or d-c reversible electric motor powers the unit.

Thread-Ezy Mfg Co, Corunna, Mich.

•

Dialing Auxiliary

Facilities for dial signaling can now be added to existing H-1 Western Electric Carrier Systems by use of Type H1-D equipment.

Capable of spanning line attenuations usually found on H1 installations, this unit includes stabilized vacuum-tube oscillators for the generation of signaling frequencies which are transmitted to the line under control of relays actuated by d-c signals from the terminal equipment.

Band-pass filters between the H1 terminals and their line filters restrict the voice channels to the range between 4,400 to 10,750 cps and release frequencies at 4,150 and 11,500 cps for the signaling channels. Incoming pulses are reconverted into d-c signals to operate switchboard or dial equipment.

Operations in the two directions of transmission are entirely independent.

Lenkurt Electric Co, 1105 Country Road, San Carlos, Calif.

•

Chemical Extinguisher

Dry chemical is ejected from the Ansul 4-B fire extinguisher through a self-closing nozzle which produces a fan-shaped stream.

The extinguisher is pressurized by a 1½ oz carbon dioxide cylinder, has a 4 lb capacity, and weighs 10½ lb when fully charged. Operating range is reported to be 12 to 15 ft.

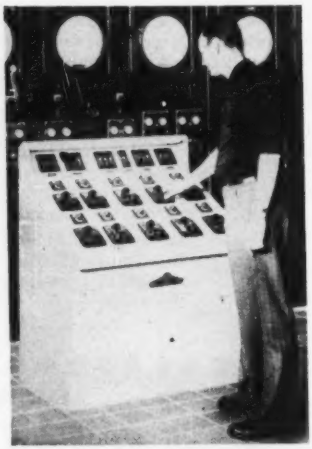
Ansul Chemical Co, Marinette, Wis.

•

Miniaturized Control Units

Space requirements for control panels in power and industrial plants may be reduced by using Mini-Line miniature indicators and control units.

These instruments make it practical to concentrate into a small space before a single operator all information



and controls for operating one or more boilers, turbines, or process units.

Space savings are considerable. A new multi-point indicator uses 87%

AT PHILIP SPORN PLANT*:

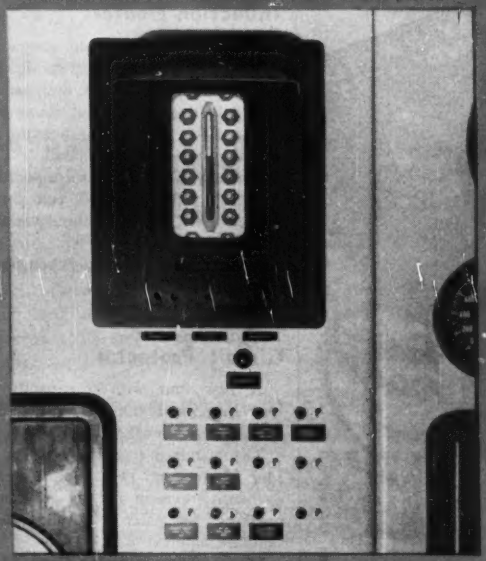
Diamond "Utiliscopes" Increase Safety and Operating Efficiency

TELEVISION IN INDUSTRY

At Philip Sporn Plant two Diamond "Utiliscopes" (wired television) enable the control room operator to see for himself the exact boiler water level . . . and the condition of the 10 burner pilots in the furnace. One "Utiliscope" camera watches boiler water level; the image of the gage shows on the viewing screen which is a part of the control panel. View-ports, which show whether burner pilots are on or off, are observed by another "Utiliscope" camera through a system of mirrors; the viewing screen on the control panel shows them as a series of 10 bright discs when all are lighted.

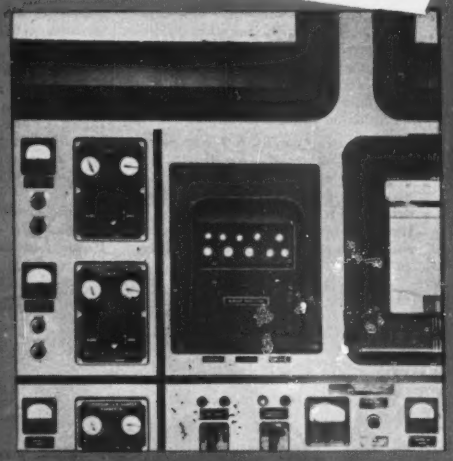
The "Utiliscope" is solving many problems in power plants and countless other places in industry. Whenever anything is too remote, too inaccessible, or too dangerous to observe directly, the "Utiliscope" is the answer. Ask for Bulletin 1025.

*Part of the American Gas and Electric Company System.



READING BOILER DRUM WATER LEVEL

The "Utiliscope" camera watches a Diamond Bi-Color Water Gauge. As indicated above, the control panel viewing screen shows a clear light and dark image which indicates water level exactly . . . changes instantly as water level changes. The "Utiliscope" provides the correct reading or no reading . . . it cannot give incorrect information.



CHECKING PILOT BURNER FLAME CONDITIONS

A "Utiliscope" camera watches the 10 burner pilot view-ports through a system of mirrors. They show on the viewing screen (which is built into control panel) as 10 bright discs. Pattern is regular, so absence of one or more discs is detected at once without counting.

"UTILISCOPE" Camera and Power Unit

* "Utiliscope"—Registered U.S. Patent Office

DIAMOND POWER SPECIALTY CORP.
LANCASTER, OHIO
Diamond Specialty Limited • Windsor, Ontario

JUST OUT!

HOW RCA 2-WAY RADIO

SAVES TIME · SPEEDS OPERATIONS · "STRETCHES" EQUIPMENT

. . . tells in non-technical language what 2-way radio is and what it does . . . shows how it works. You'll see how management can know at all times what's going on because it has voice contact with roving crews and with men at remote locations.

. . . shows how RCA 2-way radio expedites materials handling, coordinates survey and construction projects, and eliminates aimless driving in tracking down trouble . . . It reports how 2-way radio is used to route cars and trucks, to mobilize repair crews fast, and to prevent disruption to production cycles.

. . . also covers the survey facilities offered by RCA to determine the 2-way radio system that best meets your business needs . . . includes a digest of the FCC rules regulating industrial radio service . . . reveals how to co-operate with industry's frequency allocation committees.

* * *

This brochure is yours for the asking. (*In Canada, write: RCA Victor Limited, Montreal.*)

2-WAY RADIO FOR INDUSTRY
FOR
OIL AND GAS INDUSTRY · PIPELINES
PUBLIC UTILITIES · TIMBER & LOGGING
MOTION PICTURE COMPANIES · NEWSPAPERS
CONSTRUCTION · MANUFACTURING · MINING
SPEEDY COMMUNICATION WITH ALL MEN AND EQUIPMENT

MAIL TODAY

RCA ENGINEERING PRODUCTS
Dept. 5-31
Camden, N. J.

Send me a free copy of "2-way Radio for Industry."

Name_____

Firm_____

Address_____

City_____ State_____

RCA RADIO CORPORATION of AMERICA

less space than its standard size counterpart. A selector valve takes 52% less space, and a remote manual relay 70% less space.

The 3-ft 6-in. by 2-ft 6-in. bench panel shown is said to provide controls for a 220,000 pounds per hour boiler.

Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio

•

Induction Heater

For use in high speed annealing, brazing, hardening, and soldering, this 20-kw electronic unit is designed so that only the control and accessories required for a particular heating application need be purchased.

Units are available for operation on 230, 460, 350, 550 volt three-phase supply, with or without variable power adjustment.

General Electric Co, Schenectady 5, N. Y.

•

Circuit Protector

A new unit with a capacity of twelve circuits features fully magnetic action in each breaker.

The standard package consists of four 15-amp and two 20-amp breakers with provision for six additional breakers. Six pairs of handle extensions are supplied.

Murray Manufacturing Corp, 1250 Atlantic Ave, Brooklyn 16, N. Y.

•

Voltage Control

Responding to a-c line voltage fluctuations as small as one-half volt, the Sensivolt has been designed for remote operation of auxiliary equip-

±10% Regulation... in Sixteen 1¼% Steps

with New URL-16 Voltage Regulator — An Important Addition to the URL-8 Line

ASSURES MORE REVENUE FROM HEAVILY LOADED RURAL AREAS

Here's a new, low-cost answer to economical regulation in rural or suburban areas . . . at the substation or on the line. This new regulator increases the "URL" line for application in locations where a 10% range is not sufficient, and where a ±10% regulator is required. Sixteen 1¼% step operation meets these requirements under any load condition, at minimum cost.

Check these moneysaving features:

10% Regulation, Raise and Lower, in 16 Steps of 1¼% Each—Combines light weight for single-pole mounting with regulation for substation application. A double-purpose feature that cuts costs. Regulator retains every outstanding "URL" feature.

Simple Tap Changer, with Reversing Switch for ±10% Regulation—Cuts maintenance. Assures positive arc interruption and minimum voltage variation during tap changing period.

Package Control Mounted in Improved Control Cabinet—Operating relays are mounted in flexitest chassis. Separate resistance and reactance line drop compensator provides rated line drop compensation with regulator carrying only 67% rated load. All mounted in a cabinet with door hinged to provide workbench when fully opened.

For Further Information, call your Westinghouse representative, or write. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70602

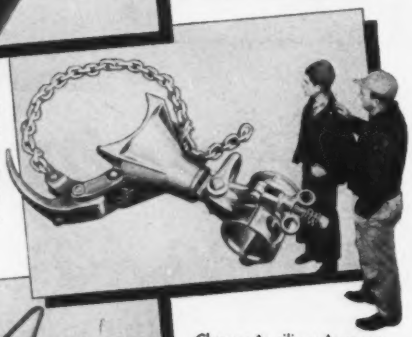
YOU CAN BE SURE... IF IT'S
Westinghouse

VOLTAGE REGULATORS

The Choice of Linemen Everywhere for *easier, safer,* live line work . . .

Ask the men who use them—they prefer Chance Hot Line Tools because heat-treated aluminum alloy fittings make them *lighter in weight*—easier to use. Features like those shown below make them faster in use, more versatile and reliable.

Chance Wire Tongs have wide jaws with smooth curved edges that hold any type of conductor without marring. They screw closed *fast* to speed application and lessen fatigue.



Chance Safety Locking Chain Tightener permits saddles to be applied quickly to poles. Saddles are light in weight—easily maneuverable—and are safe, strong and dependable.

Chance Auxiliary Arms are equipped with automatic latching wire holders to securely hold conductors. Conductors may be moved out and dropped into the wire holder without the aid of extra tools.

Complete Sets

for every type of job

make selection easy

and save you money!

This trailer protects tools from rain or snow, permits easy removal and replacement of tools, and is equipped with an electric heater to keep tools safely dry. Write for information, specifications, and prices.

ABC INDUSTRIES

No time it's RIGHT when you specify CHANCE

A. B. CHANCE CO.

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ment, protection against high or low voltage, and step by step voltage regulation.

Control may be effected by modulating voltage at the power source.

Sola Electric Co, Chicago, Ill.

•

Mechanical Seal

Designed for service on rotating shafts, such as turbines, centrifugal pumps, and agitators, Type 9 Seal incorporates a flexible ring molded of Teflon plastic. Reportedly heat resistant and chemically inert, Teflon plastic permits this seal to operate at temperatures up to 500 F.

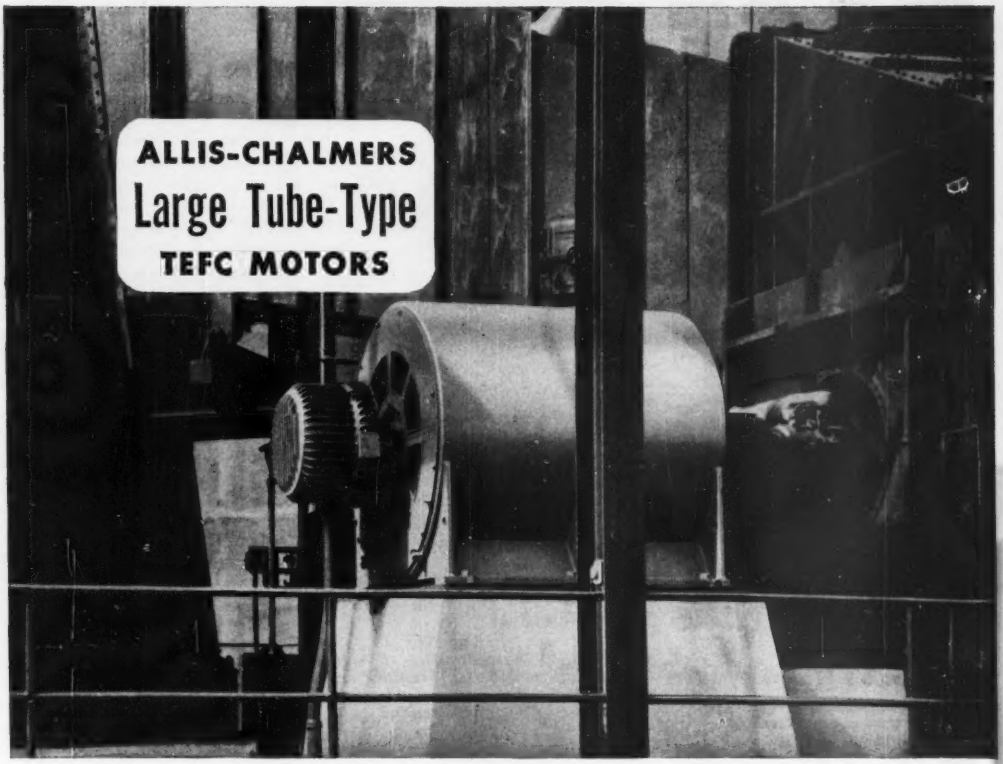
Crane Packing Co, 1800 Cuyler Ave, Chicago 13, Ill.

MORE NEW PRODUCTS
about which you should know

Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark 5, N. J., has announced an **all purpose meter for measuring moisture content** of lumber, plaster, etc. Operating on the resistance principle this unit gives instant moisture readings. . . . Electric Deodorizer Corp, 9993 Broadstreet, Detroit 4, Mich., has available a **delayed action light switch** which holds the light on for almost a full minute when the switch is snapped off.

O. Z. Electrical Manufacturing Co, 262 Bond St, Brooklyn, N. Y., has added a new **service tap** to its line of electrical connectors. Available in sizes from No 2 to 1000 Mcm (Main) No 10 to 1000 Mcm (Tap). . . . Metron Instrument Co, 432 Lincoln St, Denver 9, Colo., has made available a new three range, single head, fixed installation **tachometer indicator** for speed measuring applications where a particularly wide range of speed measurement is desired.

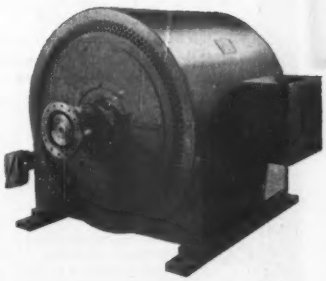
M & W Electric Mfg. Co, East Palestine, Ohio, has available a new Hex Nut Type **watertight service entrance cable connector** with tapered bushing which closes tightly around the cable. . . . Alden Products Co, 117 N. Main St., Brockton 64, Mass., is manufacturing a miniaturized **indicating fuse holder** which incorporates a neon bulb that glows when the fuse blows.



170,000 Hp Already Purchased

IN SIZES FROM 250 THROUGH 2500 HP

For really tough motor installations, central station engineers are turning to Allis-Chalmers large *tube-type* motors to get the peak reliability they know they need. Already over 170,000 hp of these totally-enclosed fan-cooled motors have been purchased. And practically 50% of the orders now are *reorders* from satisfied users.



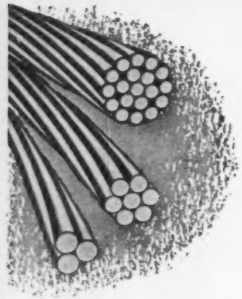
Advantages offered by the *tube-type* air-to-air heat exchanger design of these motors include:

1. Full internal air circulation—for efficient, even cooling—makes large ratings practical.
2. Complete enclosure — protects stator core and other electrical parts from corrosive conditions.
3. Self-cleaning action — results from generous flow of outside air through smooth, straight cooling tubes.

For more information about these operation-proved TEFC motors, contact your Allis-Chalmers representative, or write for new bulletin 05B7150A. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3416

ALLIS-CHALMERS

PAGE



Stainless Steel
STRAND
AND
Stainless-Copper
CONDUCTORS

Here's WHY they Save

Compared with other types strand of equal breaking strength, they . . .

- have 30-40% greater overload capacity within elastic limit.
- resist corrosion all the way through—not merely through a thin case of soft metal.
- offer highest tensile and vibration-fatigue strength (tensile strength 235,000 psi; corrosion-fatigue limit 50% of ultimate).

Here's HOW they Save

- They permit longer spans—therefore require fewer poles per mile.
- Being lighter, they are easier and faster to install in the field.
- More resistant to destructive factors, they last many times as long before replacement.

Let us tell you the whole story—

specific data, prices, recommended sizes.

PAGE Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

WHAT THEY'RE SAYING
at industry meetings

The Value of Street Lighting

F. D. Crowther, *Lighting and Rectifier Division, General Electric Co, at the Street Lighting Conference, Nela Park, Cleveland.*

Street lighting is related to mobilization! In 1950 because of night traffic accidents, 251,000,000 manhours were lost, enough labor to build 2,400 heavy bombers. The National Safety Council estimates that half of the accidents could have been prevented by adequate street lighting. And according to the Council, half of the $800,000,000 worth of materials destroyed in night accidents last year could have been saved if the nation's highways were adequately lighted.

The New CMP

John F. Skillman, *National Production Authority, at the Priorities and Allocation Clinic of the Cleveland Engineering Society, Cleveland.*

The similarities between the new Controlled Materials Plan and the old one are these: We've simplified the regulations, but we still use the same numbers and the same titles. In general, each regulation covers the same area as before.

Regulation 1 is the general regulation that describes all the ground rules for the operation of the Controlled Materials Plan.

Regulation 2 is the inventory regulation.

Regulation 3 covers priorities and how we will go into the transition quarter from straight priorities to a combination of allotments and priorities.

Regulation 4 covers warehouses—controlled material warehouses which sell steel, copper, or aluminum.

Regulation 5 covers maintenance, repair, and operating supplies.

Regulation 6 covers all phases of construction.

Regulation 7 is a new and separate order covering repair shops.

Of the two basic difference, the first we call open-ending. When we know exactly how much material is going into the defense program, we should then know how much is left over for civilian goods. We shall "open-end" these left-over materials by making them available to manufacturers for processing into civilian goods.

The second difference we call decentralization. During the first quarter of operation, manufacturers will be asked to file for materials in Washington. This will give our staff of analysts one quarter's training in Washington. At the end of the first quarter manufacturers will receive certain quantity limitations. Everyone falling below those quantities will apply in the field office, which will be staffed by the analysts trained in Washington.

Management's Responsibility

Henry B. Bryans, *president, Philadelphia Electric Co, before the Franklin Institute, Philadelphia*

Facing the electric utilities today is the need to make people aware that tax-paying, business-managed electric light and power companies are producing an abundant supply of low cost electricity; that they are able to do so because they have the most efficiently designed and economically operated generating and distribution system in the world.

Utility management has a duty to remind its customers of the benefits they receive through the utility industry. Management must make it clear to the public that they have a great stake in the preservation of the investor-owned industry that makes these benefits possible.

Selling Is the Cure

Charles A. Morrow, *vice-president in charge of sales, Mullins Manufacturing Corp, to 43rd annual convention of National Association of Electrical Distributors, Atlantic City.*

There is nothing wrong with our economy that vigorous selling could not and will not cure. Creating a product is one thing; but creating a desire for it and moving it into the hands of thousands who want and need it is just as important. The two go hand-in-hand and one cannot endure without the other. Wise indeed is the distributor who actually recognizes this to the fullest extent and acts accordingly. Mass production can survive only if mass consumption matches it.

kills 'em dead!

Lowest Cost way to get rid of brush, scrub trees, sprouts and weeds

Thompson's Quick, positive kills assured with tested Bramble-Weedicide (2,4,5-T, 2,4-D Low Volatile Esters)

When you spray Thompson's brush and weed killers, you kill 'em dead and for keeps — at a fraction of the cost of other methods. Foliage spray, stump or basal bark treatment, you get positive results at bottom dollar cost. That's because Thompson's brush and weed killers embody the newest technology — they are low volatile for honest economy and low polarity for quicker and more complete absorption.

Thompson's exclusive Middle West research helps you to cut costs and avoid errors. Tells you when to spray, when to use basal bark treatment, what to apply and how to mix it for maximum economy and results. For free, helpful charts and information, write — describing nature of growth to be killed off — to: Research Department, Thompson Horticultural Chemicals Corp., St. Louis 3, Mo.

Thompson

HORTICULTURAL
CHEMICALS CORP.
St. Louis 3, Missouri
Los Angeles 27, California

other *Thompson's* tested
WEED & BRUSH KILLERS
- WEEDICIDES: 2,4-D Esters and Amines
- BRAMBLCIDE 2,4,5-T Low Volatile Ester
- PHYTOCIDE, PENTA-WEEDICIDE — General Weed Killers

NEWS ABOUT PEOPLE

Arkansas-Missouri Utility Elects Czeschin President

Charles C. Czeschin, executive vice president of the Arkansas-Missouri Power Co, has been elected president of the company. He succeeds James Hill, Jr, who has retired.

C. C. CZESCHIN

Czeschin joined Arkansas-Missouri in January. Previously he had been associated with Missouri Public Service Co for 27 Years. When he resigned from the Missouri utility to join Arkansas-Missouri he was vice president and secretary. He also was secretary and treasurer of the West Missouri Power Co.

Hill had been president of Arkansas-Missouri for the past 18 years. Before that he served as general superintendent of Southwestern Gas & Electric Co, Shreveport, La.

•

J. S. McGregor has been appointed assistant general manager of the Toronto Hydroelectric System. New chief engineer is **C. E. Schwenger.** The Toronto Electric Commission in another appointment named **D. G. Moffit** its secretary.

William H. Radford, member of the electrical engineering department of the Massachusetts Institute of Technology, has been promoted to the rank of professor. In other promotions in the department **Donald P. Campbell** and **Robert M. Fano,** assistant professors, were made associate professors.

John Ward Dawson has been appointed chief engineer for the Electronics Division of Sylvania Electric Products, Inc. In charge of equipment engineering for Stanford Research Institute since 1949, he formerly worked for Westinghouse Electric Corp and the Raytheon Manufacturing Co.

Harold S. Smith has been appointed superintendent of the Joppa Steam Electric Station of Electric Energy, Inc. He formerly was assistant manager of a Dayton Power & Light Co power station.

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Delta-Star Appoints Romano Sales Manager

Delta-Star Electric Co, division of H. K. Porter Co, Inc, Pittsburgh, has

JOHN ROMANO

appointed John Romano general sales manager.

In other appointments M. T. Schmid was named comptroller; R. S. Keeler, manager of utilities sales; and W. H. Boyce, manager of the industrial division.

Romano has been with Delta-Star since 1927. He started in the engineering department and later entered the sales department. In 1945 he was named assistant sales manager.

Connecticut L&P Elects Forman Vice President

Walter W. Forman, general superintendent of Connecticut Light & Power Co, has been elected vice president in charge of operation for the

W. W. FORMAN

company. He succeeds Calvin T. Hughes who has been placed in charge of the engineering department. Forman will make his headquarters at Waterbury.

Joining CL&P in 1929 as general engineer, he became assistant general superintendent in 1943 and general superintendent in 1949.

Forman entered the public utility field in 1923 as a junior engineer with the Adirondack Power & Light Co, Schenectady, N. Y. Later he served on the staff of W. A. Shoudy, New York utility construction engineering firm.

Hughes, who joined Connecticut L&P in 1918, was named operating vice president of the company in 1949. Previously, he had served as electrical engineer, general superintendent, and supervised construction in many parts of the company's system.

•

F. J. Van Poppelen has been named general manager of General Electric Co's air conditioning department. His headquarters will be in Bloomfield, N. J. Van Poppelen has been assistant general manager of the department since the first of the year. He joined

This Steel-Service Team for Electric Utility Requirements

Convenient to electric power and light companies from coast to coast, thirteen Ryerson steel-service plants stand ready to supply these utilities and their equipment manufacturers.

True, shortages resulting from the twin pressures of defense requirements and unprecedented civilian demand may make it impossible for us to furnish every item on every order, much as we would like to. But it is likely that many of your requirements are among the carbon, alloy and stainless steels we have on hand for prompt shipment. And experienced Ryerson steel men are always glad to work with you—help you make the most of available steel.

From switchboard to shipping floor all of us are ready to give you prompt service whenever humanly possible. So call us for every steel need.

PRINCIPAL PRODUCTS

BARS—Carbon and alloy, hot rolled and cold finished, reinforcing bars, etc.

STRUCTURALS—Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plates, Inland Hi-Steel, etc.

SHEETS—Hot and cold rolled, many types and coatings

TUBING—Seamless and welded, mechanical and boiler tubes, structural tubing, etc.

STAINLESS—Allegheny sheets, plates, bars, tubes, pipe, pipe fittings, etc.

BABBITT METAL—Ryerson Glyco in 3 grades

MACHINERY & TOOLS—for metal fabrication

RYERSON STEEL

RYERSON CERTIFIED STEELS

Reg. U. S. Pat. Off.

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI
CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

GE in 1949 working in the office of the vice president in charge of manufacturing policy. Previously he served as vice president of the Hupp Corp, Cleveland.

C. G. Bennett, has retired as vice president of Public Service Co of Northern Illinois. He joined the utility in 1928 as an assistant in the operating department and later became head of the transportation and auto shops, the meter department, and the general shops. In 1940 he was placed in charge of all rate activities of the company and three years later was elected a vice president.

Chester F. Ogden, purchasing agent for Detroit Edison Company, was elected president of the National Association of Purchasing Agents at its annual June convention held in New York. Ogden has been with Detroit Edison since 1934.

Cyrus W. Rieder, Jr, supervisor of operations, has been named assistant manager of Dayton Power & Light Co's O. H. Hutchings Station. **John R. Calhoun,** test and efficiency engineer for the station, will succeed Rieder. In other appointments **Richard H. Neal** was named assistant supervisor of the transmission and distribution engineering department and **Harry G. Gossman** transmission and distribution standards engineer.

Hiram F. Rich has been appointed general distribution superintendent of Central Vermont Public Service Corp. The utility has named **John J. Lowre** his successor as distribution superintendent at Bennington. **Howard C. Stevens** has been made assistant distribution superintendent at Bennington. Rich joined the company in 1928 as a groundman.

Raymond A. Schmidt, assistant to the president of Dayton Power & Light Co since 1947, has been appointed western division manager at Greenville, Ohio. He replaces **C. Earl Lakin,** recently named a vice president of the company.

Brig Gen John F. Conklin has retired from the Army Corps of Engineers after 36 years of service. He is a former district engineer at Nashville, Tenn.; Huntington, W. Va.; and Norfolk, Va.

Allis-Chalmers Advances Yost, Roberts, and Allen

Allis-Chalmers Manufacturing Co has named W. A. Yost to head its new mechanical power department. Yost has been manager of the company's steam turbine department since 1947.

The company also appointed J. F. Roberts director of engineering of the general machinery division and R. C. Allen consulting engineer.

Yost joined the company in 1943 as

W. A. YOST

manager of the steam turbine department's marine division. Two years later he became assistant manager of the department.

Roberts came to Allis-Chalmers in 1919 and served as office manager in the hydraulic department. In 1927 he left the company to become hydraulic engineer with the Power Corp of Canada. In 1936 he was named head hydraulic engineer for the Tennessee Valley Authority. Returning to Allis-Chalmers in 1942, Roberts headed the hydraulic department.

Allen joined the company's steam turbine department in 1936. He served as chief engineer, assistant manager, and manager and chief engineer of the steam turbine department. In 1947 he was named manager and chief engineer of the turbo-power development department.

Named as Yost's assistants were O. A. Haas, manager of the blower and condenser section; T. J. Hodan, manager of the water conditioning section; C. C. Jordan, manager of the steam turbine section; and W. J. Rheingans, manager of the hydraulics section.

Haas formerly was manager in charge of sales of the blower and condenser department. Hodan has been manager of the water conditioning department since 1948. At the time of his new appointment Jordan was manager of the central station and industrial sales department. Rheingans has been assistant manager of the hydraulic department.

OBITUARY

Dr E. L. Moreland

Dr Edward L. Moreland, 65, who retired last month as executive vice president of Massachusetts Institute of Technology, died June 17 at West Falmouth, Mass. He had been a partner in the Boston engineering firm of Jackson & Moreland for 35 years.

Moreland became head of MIT's electrical engineering department in 1935 and three years later was named dean of the Engineering School. In 1942 he was appointed executive vice president.

During World War II Moreland served as executive director of the National Defense Research Council in the development of new weapons, including the atomic bomb. In 1945 he became chief of Gen Douglas MacArthur's scientific and technical staff.

•

Charles E. Neil, 62, assistant to the president of The North American Co, died at New York June 15. A rate specialist, Neil joined North American in 1924 as assistant to the vice president and general manager. In 1933 he was appointed assistant to the president. He later became associated with Union Electric Co of Missouri, Cleveland Electric Illuminating Co, Wisconsin Electric Power Co, Illinois Power Co, and Kansas Power & Light Co, subsidiaries of North American. In 1941 he returned to the parent company's offices as rate specialist and representative to utility associations. He became assistant to the president last month.

Walter E. Harris, 62, retired sales manager of the Haverhill (Mass.) Electric Co, died at Newburyport, Mass., June 9. He had been with the company 23 years, retiring in 1948.

John Moran, 78, president of the Clinton (Conn.) Electric Light & Power Co, died at New Haven June 17.

A REAL BARGAIN

figured in years per dollar

If you ask the question, "Will this station insulator fit my system standards?", the answer can be found quite easily, as industry specifications rigidly define measurable qualities.

What if you ask, "How many years will this station insulator give satisfactory service?". There is no ready answer to this question -- at least not until those years are up!

Be sure to distinguish between what *can* and what *can't* be specified when you purchase station insulators; likewise be sure to recognize that the thing you want most, and the thing that determines your money's worth -- performance -- is not subject to standards or specifications. That's why there can be such a big difference between makes of products in such a highly standardized field.

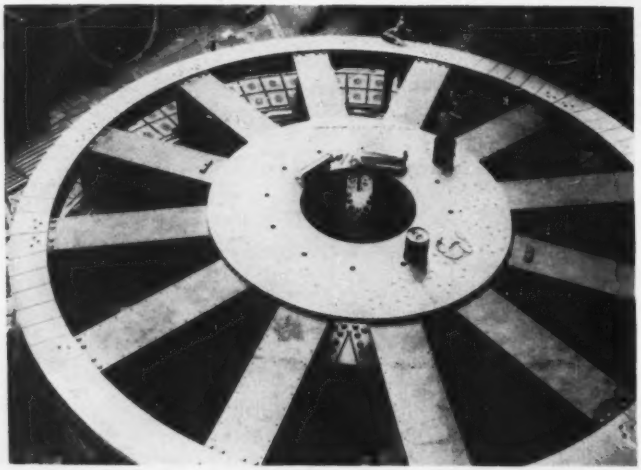
Most O-B station insulators are bought on repeat order, by companies that have *had* their chance to gauge their money's worth. For a genuine bargain, figured in years per dollar, insulate *your* stations with O-B.

Ohio Brass

MANSFIELD • OHIO

4130-H

MANUFACTURERS and MARKETS



ROTOR SPIDER for a 27,000-kva, 69.2-rpm hydro generator is shown mounted on a boring mill where the brake plate, on the outside periphery of the spider, has just been machined. Rotor is being built at General Elctric Co plant at Schenectady

New Type of Lighting Produced by Sylvania

Sylvania Electric Products, Inc, has developed a new method of producing light employing flat sheets of glowing glass. The new development, given the name "Panelite" by the company, is the commercial application of theories on electroluminescence presented in a paper a year ago by Sylvania scientists at the national technical conference of the Illuminating Engineering Society at Pasadena, Calif.

Electroluminescence is the creation of light by the excitation of certain materials placed in a fluctuating electric field. The materials will continue to emit light as long as the excitation is continued.

Unlike incandescent and fluorescent lamps, panelite does not use filaments, bulbs, or tubes. It makes possible the direct illumination, at low intensity, of an area such as a ceiling, clock face, or table top. Up until now it has been necessary to diffuse or redirect the concentrated radiation of the incandescent lamp or the line of light produced by the fluorescent lamp to illuminate flat areas.

One of the chief advantages of panelite is the saving in space over conventional types of lighting. Panelite lamps are virtually the complete fixture. They occupy no more space than the thickness of a pane of glass. Furthermore this type of light is expected to have a life of from one to five years and will require little or no maintenance. Cost of operation is extremely low.

Among the applications of panelite are luminous panels for walls, windows, and other structural elements; dial faces for clocks, instruments, and meters; viewing plates for x-rays, photo transparencies, tracings, and industrial inspection; switch plates; stair risers; guard rails; exit signs; table tops; and decorative lighting.

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Russell Electric Co Sold

Russell Electric Co, Chicago, a subsidiary of Raytheon Manufacturing Co, Waltham, Mass., has been sold to Charles Frost of New York.

Price of Tin Slashed Sharply During June

The price of tin dropped 39¢ a lb during the first three weeks of June. In a series of slashes the Reconstruction Finance Corporation, the sole importer and distributor of tin in this country since March, cut the price of the metal from $1.45 to $1.06 a lb.

Object of the cuts was to force the price of tin down in the foreign markets of the world.

The price war actually began in March when tin was selling for $1.83 a lb in the Singapore market. Pre-Korean level was about 74¢ a lb. The U. S. government decided the price was too high and stopped purchases of the metal for stockpiling.

In the last few weeks the price battle developed into a war of undercutting between the RFC and the Singapore market. RFC matched the Singapore market's reduction to $1.06 a lb. More recently the Singapore market raised its price to $1.11⅛¢ a lb at the smelter bringing the price war to a halt.

Metal Prices
June 25, 1951

COPPER, Conn. Y., lb.	$ .24½
LEAD, N. Y., lb.	.17
ZINC, prime Western, E. St. Louis, lb.	.17½
TIN, Straits, qual. N. Y., lb.	1.06
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

•

Westinghouse Prepares Course on Transformers

A basic training program on distribution transformers has been developed by Westinghouse Electric Corp's transformer division, Sharon, Pa., for employees of utility companies.

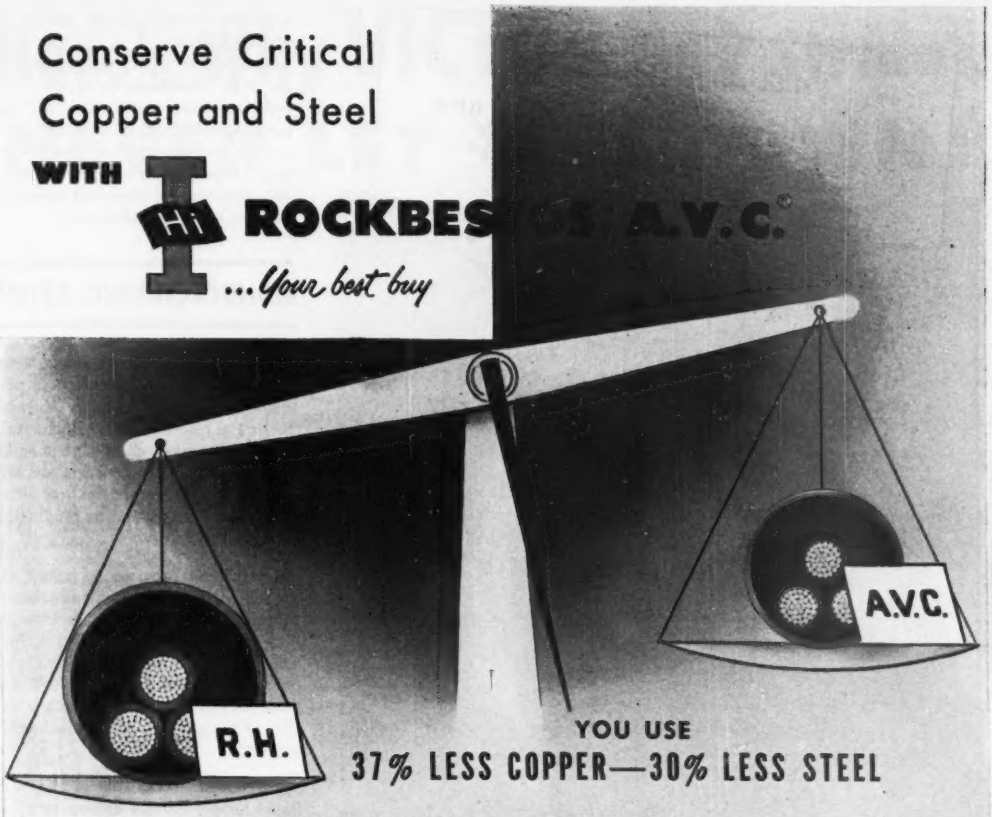
The six-lesson course consists of lectures, movies, and slides. Wall charts, working models and demonstration kits, study manuals, and lesson guides for the instructor also have been prepared.

The entire packaged programs are

Conserve Critical Copper and Steel

WITH Hi ROCKBESTOS A.V.C.®

...Your best buy



YOU USE

37% LESS COPPER—30% LESS STEEL

For a 430 ampere load, 3Ø, 3 wire, 40°C Ambient, 100' run—NEC chapter X

		TYPE RH	TYPE A.V.C.	
CONDUIT	SIZE	4 inch	3 inch	A saving of 327 lbs. of steel
	WEIGHT	1089 lbs./100'	762 lbs./100'	
CABLE	SIZE	800 MCM	500 MCM	A saving of 277.8 lbs. of copper
	WEIGHT	741 lbs./100'	463.2 lbs./100'	

Write for booklet "Rx for a Building with Hardening of the Arteries."

Hi $I=\frac{E}{R}$

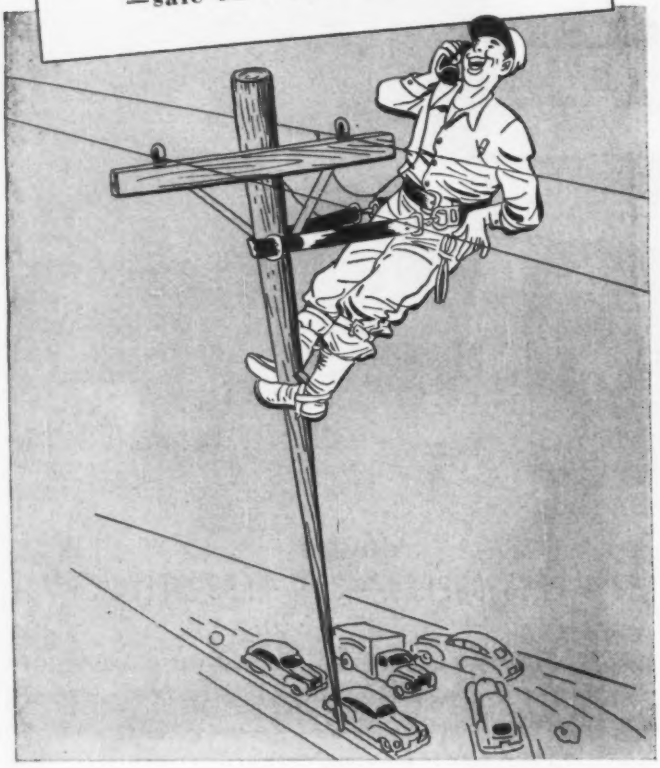
...Your best buy

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

Chicago, Detroit, Pittsburgh, St. Louis, Cleveland, New York, New Orleans, Los Angeles, Oakland, Calif.

"Had some close shaves
in traffic, dear. But I'm okay now
—safe on a KOPPERS POLE!"



● Experienced linemen do feel safe when they're working on Koppers Poles. For one thing, with Koppers Poles, linemen's gaffs always get a good, solid bite on wood that's sound and strong—on wood that hasn't been weakened by shell rot.

Koppers Full-Length Pressure-Creosoted Poles are strong—even after they've been in line for decades. This strength-retaining factor means long pole life. Less maintenance work. Fewer pole replacements. Long periods of continuous service.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-TREATED WOOD

available without cost to utilities for 60-day periods.

The course begins with a study of the basic fundamentals of electricity and transformer construction and proceeds to a discussion of transformer application, maintenance, and protection. Practical transformer installation problems are presented which the students solve for themselves.

MANUFACTURING BRIEFS

Buchanan Electrical Products Corp has moved its entire facilities to a new plant at 225 Highway 29, Hillside, N. J. The building houses Buchanan's general offices as well as experimental, engineering, and production departments. The larger facilities will allow the company to expand its production capacity.

An expansion program to handle increased defense and civilian production will be undertaken by the Orangeburg (N. Y.) Manufacturing Co, Inc. The company, which manufactures pipe and electrical conduit, will expand its main plant at Orangeburg. Cost of the program is estimated at $2 million.

Sprang-Chalfant Division of the National Supply Co has moved its New York City offices from 30 Rockefeller Plaza to 600 Fifth Ave at corner of 48 St.

The New York office of the Miller Co, manufacturers of lighting equipment, has been moved to 33 West 42nd St.

SALES ASSIGNMENTS

COMPANY STAFFS

Reliance Electric & Engineering Co, Cleveland, has appointed Lloyd F. Giegel branch manager of its Gary, Ind., sales office. The company also has added Daniel J. Donnelly in a sales engineering capacity to its Philadelphia office staff. Giegel has been with the company since 1947 and Donnelly since 1950.

REPRESENTATIVES

W. N. Mathews Corp, St. Louis, has named John R. Noyes, 160 Maplefield, Pleasant Ridge, Mich., as its sales representative in Michigan with the exception of the upper peninsula.

Sylvania Electric Products, Inc, has appointed Spiller's, Kennebunk, Me., as sole distributors of its television and radio sets in the southern Maine area.

Here's Why VICTOR Guy Strains NEVER LET YOU DOWN!

V **THEY'RE STRONG!** VICTOR'S de-airing process produces porcelain of maximum density and tensile strength.

V **THEY'RE MADE OF HIGHEST QUALITY WET PROCESS PORCELAIN** designed and manufactured to give unequalled mechanical and dielectric characteristics.

V **THEY'RE INDIVIDUALLY INSPECTED** at every point of manufacture, one of many reasons why VICTOR Guy Strains are famous for durability and long service!

V **THEY'RE QUALITY CONTROLLED!** All shipments of flint, feldspar and clay used in VICTOR Guy Strains are stored in separate bins and tested for quality and uniformity before using.

V **SMOOTH, HARD GLAZE** protects them against weathering and contamination—cuts maintenance and replacement costs.

VICTOR NO. 504 GUY STRAIN INSULATOR. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

VICTOR Guy Strains are better because our engineers, technicians and craftsmen have the "know-how" to make them better! Each one is made with the same high grade materials and careful workmanship as are VICTOR's famous high voltage insulators. That's why more and more power companies are specifying VICTOR Guy Strains—the standard of the industry.

Do You Know that...

VICTOR is one of the largest manufacturers of spools in the country? They, too, are made of genuine VICTOR wet process porcelain. Every one is made to close, rigid tolerances to fit perfectly the proper rack or clevis.

Specify

VICTOR

GUY STRAIN AND SPOOL INSULATORS

VICTOR INSULATORS, INC. VICTOR, N. Y.

ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Colorado—San Luis Valley Rural Electric Corp., Monte Vista, 75 mi. rural distr. lines, 53 mi. transmission lines, 38 mi. tie lines and completion previously approved construction Alamosa Co., $1,110,000. G. W. Robertson, c/o owner, company engr. Carl Cox, Barfield Bldg., Amarillo, Tex., consult. engr.

Ill., Dixon—State Div. Architecture, & Eng., State Capitol, Springfield general work, heating and plumbing work, pipe covering, electrical work, kitchen equipment for alterations to "B" dining room, Dixon State Hospital.

Ind., North Madison—General Electric Co., R. C. Stuart, exec. vice pres., Bloomfield, N. J., 2 brick, steel lamp and glass factory bldgs.; 1 story glass factory, on 70 acre site, U. S. Road 421 and State Rd. 107, $2,000,000. Austin & Co., 16112 Euclid Ave., Cleveland, O., consult. engrs. and archts.

Mo., Kirkwood (St. Louis 22, P.O.)—City, Wm. C. Mason, clk., 139 S. Kirkwood Rd., voted $125,000 bonds June 12, exten., imprv. electric distr. sys.

Montana—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., erecting towers and constr. hutments for Fort Peck, Lindsay Ridge and Big Snowy Mountain radio relay stations, For Peck Proj., Spec. 600C-67, L. N. McClellan, Bldg. 1A, Denver Federal Center, Denver, Colo., ch. engr.

North Carolina — Piedmont Electric Membership Corp., Hillsboro, 431 mi. rural distr. lines, 19 mi. transmission line, sys. imprvs., Person Co., $1,680,000.

O., Maple Heights—Ohio Electric Mfg. Co., 5900 Maurice Ave., S. E., Cleveland, 35,000 sq. ft. factory.

R. I., Newport—P. Wks. Office, Newport, rehabilitation of electric power and lighting sys. for fuel storage tanks, Spec. 28625; installing 5-kv submarine cable, Spec. 29217; repair 22kv. Locality substation, installing cables, ducts, etc., Spec. 29242. Plans deposit $10, each.

S. C. Charleston—Dpt. Navy, Officer in Charge of Construction, Box 365, Naval Base, renewing lighting and 208 volt power services on Piers A and B at Minecraft Base. Plans deposit $10.

Va., Norfolk—Dist. Pub. Wks. Office, Headquarters, Fifth Naval Dist., U. S. Naval Base, Zone 11, expansion electric facilities Bldg. V-28, U. S. Naval Air Station, NOY 24785, Spec. 26924.

Va., Quantico—Dist. Pub. Wks. Office, Potomac River Naval Command, Naval Gun Factory, Wash., D. C. overhaul and rehabilitation electrical distr. sys. at Marine Corps Schools, NOY 27005, Spec. 29007. Plans deposit $10.

Washington—Bonneville Power Admin., 827 N.E. Oregon St., Portland, Ore., constr. Benton Sub-station, Inv. 5869, Benton Co., Plans deposit $25. L. C. Stewart, 827 N.E. Oregon St., Portland, Ore. engr.

Washington—Bureau Reclamation, Dpt. Interior, Ephrata, constr. 4 radio communication bldgs. and 2 antenna towers for O&M headquarters at Ephrata, Quincy and Othello, Columbia Basin Proj., Spec. 117C-108, L. N. McClellan, Bldg. 1-A, Denver Federal Center, Denver, Colo., ch. engr.

Washington—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., transformer, lightning arresters, switch, disconnecting fuses for upper Saddle Gap Pumping Plant Switchyard, Columbia Basin Proj., Spec. DS-3462. L. N. McClellan, ch. engr.

Wisconsin—Grant Electric Co-operative, Lancaster, system imprvs. and headquarters facilities, Grant Co. $343,000.

Man., Portage La Prairie—D. W. Laird, engr. Defence Constr. Ltd., 400 Kensington Bldg., Winnipeg, design, fabrication and installation 3 steam generating units, each 25,000 lbs. of steam per hr. Approx. $175,000. Plans deposit $50.

Man., Winnipeg—D. W. Laird, engr., Defence Constr. Ltd., 400 Kensington Bldg., design, fabrication and installation

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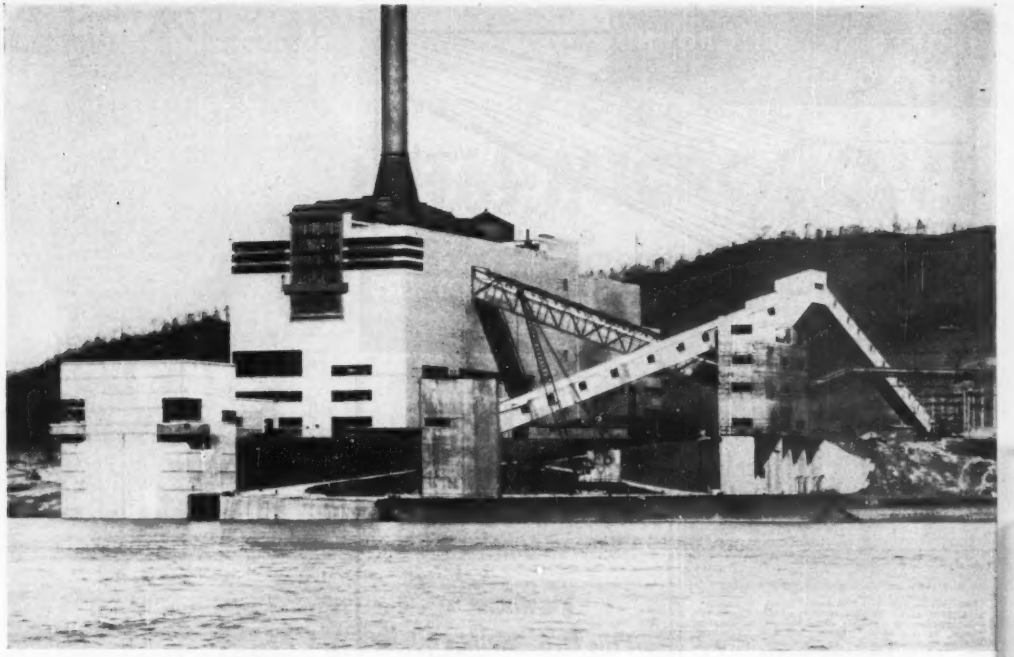

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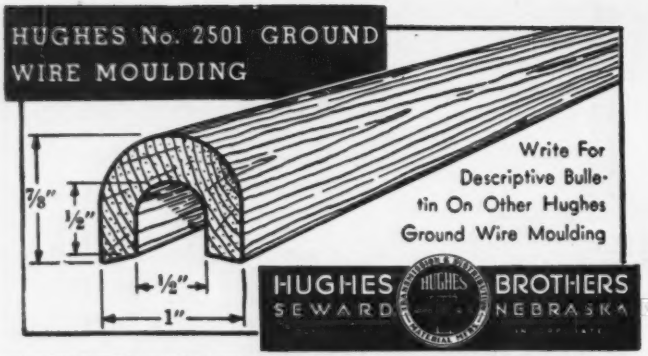

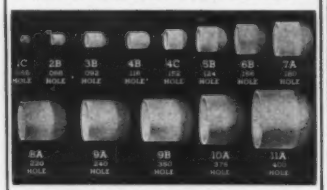

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Sask., Moose Jaw—D. W. Laird, engr. Defence Constr. Ltd., 400 Kensington Bldg., Winnipeg, Man., design, fabrication, installation 3 steam generating units of 25,000 lb. steam per hour each, Approx. $175,000. Plans deposit $50.

Sask., Saskatoon—D. W. Laird, engr., Defence Constr. Ltd., 400 Kensington Bldg., Winnipeg, Man., design, fabrication and installation 3 steam generating units, output each 25,000 lbs. of steam per hr. Approx. $175,000. Plans deposit $50.

Ont., Camp Borden—S. M. Connolly, engr., Defence Constr. Ltd., 441 Queens' Quay W., Toronto 2B, supply, install. 3 bit. burning steam generating units at Army Camp, Approx. $90,000. Plans deposit $50.

Low Bidders & Contracts Awarded

Florida, Live Oak—Suwannee Valley Electric Co-operative, live Oak, Fla., Owner Builds. $190,000, 112 mi. rural distr. lines.

N. Y., Bayside—John H. Eisele Co., 18 E. 4 St., New York, 17, N. Y. Contract Awarded. Approx. $1,000,000-$2,000,000, metallurgical Laboratory, at 57 acre research site for research for Atomic Energy Commission. Sylvania Electric Products Co., Inc., 35-05 Bell Blvd., Bayside, N. Y. Carr, Wilcox & Erickson, 80 W. 40 St., New York, 18, N. Y., archts.

Oregon—Morgan Smith Co., York, Pa. Low Bidder. $8,225,257 six 111,300 hp. hydraulic turbines for McNary Dam, Units 9 to 14, Inv. No. CIVENG 45-164-51-56. U. S. Eng., Bldg. 602, City-County Airport, Walla Walla, Wash. Bids June 15.

South Dakota—Woodward Governor Co., Rockford, Ill. Low Bidder. $267,472. turbine governors, Fort Randall Reservoir. Proj. Inv. 140. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids June 7.

South Dakota—American Bridge Co., First National Bank Bldg., Denver, Colo. Low Bidder. $4,178,114. 220 kv transmission lines galvanized steel double circuit towers, appurtenances for Oahe-Fort Randall-Sioux City, Missouri River Basin Proj., Spec. DS 3391. Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo. Bids June 15.

Alaska, Whittier—Haddock Engineers, Ltd. and Wayrt & Kipper, Securities Bldg., Seattle, 1, Wash. Low Bidder. $5,827,000, est. $3,708,036, permanent heating and power plant, incl. moving equipment from Dutch Harbor, S 95-507-51-94. U. S. Eng., New Washington Hotel, Seattle, 1, Wash. Bids June 14.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Calif., San Leandro—Crown-Willamette Paper Div., Crown Zellerbach Corp., 343 Sansome St., San Francisco, paper processing plant, West Ave. and Merced St. $3,000,000.

Conn., Windsor Locks—Kaman Aircraft Corp., Bradley Field, helicopter plant, North Bloomfield site. $3,900,000.

Fla., Pensacola—Chemstrand Corp., c/o Monsanto Chemical Co., 1700 S. 2 St., St. Louis, Mo., nylon plant on 2,000 acre tract on Escambia River, $20,000,000.

Ga., Rome—Mead Corp., 118 W. 1 St., Dayton, O., paper mill for Kraft Container Bd. on 700 acre tract. $21,000,000.

Kan., Baldwin City—Baker University, Redevelopment Comm., Dr. Nelson P. Horn, pres., Baldwin City, auditorium and new buildings. $3,000,000.

Kan., Topeka—Crosby Bros., 719 Kansas Ave., department store addn. $2,000,000.

N. J., Port Newark—Port of New York Auth., 111 8 Ave., New York, N. Y. 200x560 ft. Cargo Terminal Bldg. No. 140; 200x460 ft., cargo, terminal bldg. No. 141 and 560 ft. long wharf in front of bldg., east of Export St.; 50x565 ft. concrete deck open wharf east of Export St. Approx. $5,000,000.

N. Y., Syracuse—General Motors Corp., Brown-Lipe-Chapin Div. General Motors Bldg., Detroit, Mich., 400,000 sq. ft. factory on 100 acre tract. $8,000,000. Argonaut Realty Co., General Motors Bldg., Detroit, Mich., consult. engr.

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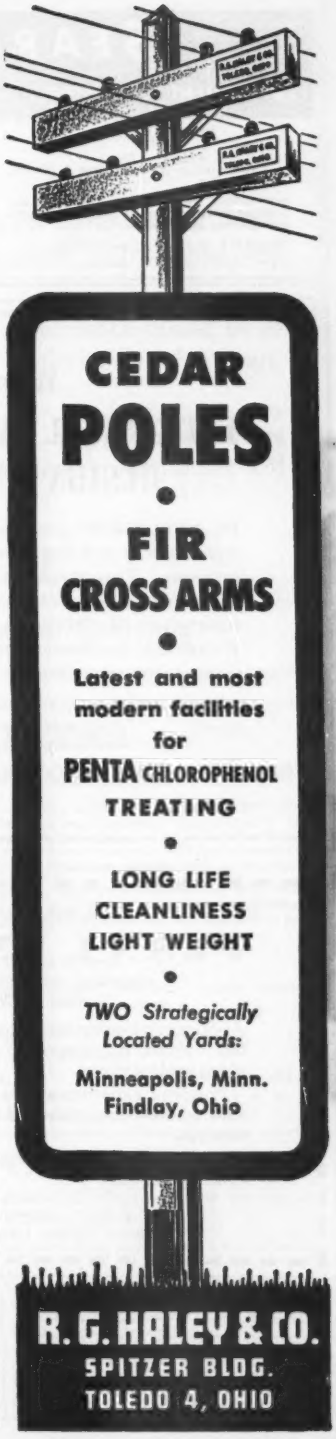

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CONSULTING ENGINEER with 20 years experience in the utility field desires responsible position with operating electric utility either in management or engineering. Experience includes all phases of design, operation, accounting methods, valuation and rate analysis. Details gladly furnished upon request. Write PW-1122, Electrical World.

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Engineers Fabricators Constructors Consultants

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P-1137, Electrical World
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Electrical	Power, lighting layouts and electrical controls.
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Please submit complete resume stating experience, education, salary required and availability date.

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For design and research engineers. M.E. or E.E. degree. Several openings requiring 2 to 10 yrs. experience. Will design or test electrical power and transmission and distribution equipment and tools. Design engineers must know manufacturing processes, metals. Prefer research engineers with some industrial testing or laboratory experience.

These are steady jobs with a long established company, working on our regular product lines. Pay commensurate with ability and experience. Modern plant and equipment. Midwest location. Good working and pleasant living conditions. Vacations, sick leave with pay, profit sharing, group insurance.

State age, experience, education, status in first letter. Replies confidential.

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Must have experience in design, development, manufacture and research on rubber, paper, plastic and varnished cambric power cables. Administrative and supervisory experience essential.

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ALSO

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Single phase, 3 wire
Types G.E. I-14 or I-16
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3—600 KW 750 KVA Diesel Electric Generator Sets (2—Ingersoll-Rand and 1—General Motors).

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One dead-front distribution switchboard mounting 1600 Amp. 250 V. Main air circuit breaker & 6—100 Ampere Klampawfuz distribution circuits, 1000 MCM Solderless lugs for line side of main circuit breaker. Double right-angle cable trough for use between line circuit breaker & metering board. Inspection by appointment.

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Suitable for obtaining a minimum of 15 Kva, single-phase, at 240 cycles minimum—

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5—714 HP Combustion Engineering WATER TUBE BOILERS, with Ebasco Superheaters. Sturtevant High Pressure Economizers. Green Chain Grate Stokers. Hagan Combustion Controls. Copes Feed Water Regulators. Clarage Forced Draft Fans, with Hoppers. Automatic Coal Conveyors. Automatic Ash Conveyor. 36" x 24" Jeffrey Flex-Tooth Coal Crusher.

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1—10,000 KW Allis-Chalmers STEAM TURBINE.

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All with complete control equipment.
Send for complete Inventory in Denver.

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All 1 phase, 60 cycle, air cooled

No.	KVA	High Voltage	Low Voltage	Mfr.
1	2500	14025/12440	3100/2640	G.E.
2	2000	14100/7510	3100/1493	Whse
3	2000	14000/11900	2940/2785	Whse
6	1000	14000/7510	2945/2795	G.E.
3	1000	14000/7510	2945/2811	Whse
6	50	2750/1375	220/110	Whse
6	25	2750/1375	220/110	Whse

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38—60 KVA induction regulators, 1 phase, 60 cycle, 10% regulation, primary voltage 3000, secondary amperage 200. Westinghouse type C.

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3—115 KVA, 300 amps, 60 cycles, 13200 V
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18—15000 V, 600 amps 8—3000 V, 1200 amps
28— 7500 V, 300 amps 34—3000 V, 300 amps
2— 7500 V, 1200 amps 2—2500 V, 200 amps
1— 7500 V, 600 amps

ALSO: Potential transformers, time element overload and current relays, reverse power relays, auxiliary relays, KWH meters, voltmeters, wattmeters and ammeters.

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19—150 KVA G.E. rebuilt submersible or vault type network transformers that are type HT, form DW, three phase, 60 cycle, Primary Volts: 27680; Secondary: 216Y/125, cont. 55° rise. Tap Voltages: 27640/26385/25705/25300/24355. Each transformer is complete with MG6 submersible type heavy duty network protector and primary switch. Complete with oil and accessories. Serial number 5098247.

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FOR
IMMEDIATE SHIPMENT
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1375	Fairbanks Morse	33F16	2000	300	375	Enterprise	DSG-6	480	480
1420	Fairbanks Morse	38D8½	1600	720	250	Superior	KNA	400	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand	S	225	514
425	Baldwin	VO-6	510	450	187	General Motors	6-268A	180	1200
400	Beckwyth	80	480	600	75	General Motors	6045C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

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TURBO GENERATORS

Qu	KW	Make	Desc.
1—	6000	Al. Ch.	Condensing 300/250 I.S.P. 2300 v. 3/60 Exc. & Surface Cond.
2—	750	G.E.	Condensing — 425 lbs. 750 T.T. I.S.P. 440v. 3 ph. 60 cy.— Built 1944
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

	KVA	Make	Type	Volts	Speed
1—	5140	Whse.		2400/4150	600
1—	3000	Whse.		2400/4900	720

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	600 25 cy.	11000
1—	1500	G.E.	600	125/250	2300/4150
1—	1500	G.E.	360	275	2300/4400
1—	1000	Whse.	900	600	4150
1—	1000	G.E.	900	600	2300/4150
1—	750	G.E.	900	275	4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
2—	4000	G.E.	HT	3	22000x2300
3—	1250	G.E.	HVDDJ	1	6600x550
4—	500	G.E.	HDD	1	22850/13200x480
4—	333	G.E.	HKDD	1	13800/6900x230/460
6—	300	G.E.	HT	3	2400x240/480
8—	300	G.E.	HT	3	13800x240/480

BELYEA COMPANY, INC.
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DIESEL POWER PLANT
FOR IMMEDIATE DELIVERY
EXCELLENT CONDITION

300 KW Generator DC 550/275 Volts. 450 HP Atlas Engine 360 RPM. Complete with switchboard, air starting tanks, miscl. equipment, spare parts, tools, etc.

Equipment can be seen operating. Any reasonable offer will be considered.

THE POWER AUTHORITY
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1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
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3— 400 KVA G.E., 1 Ph., 6600V 2300V Sec.
1— 200 KVA G.E., 3 Ph., 2400V 220 Sec.
1— 150 KVA G.E., 3 Ph., 4150V 120/208Y.
6— 50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.
6— 25 KVA G.E., 1 Ph., 440/220, 220/110 Sec.

SYNCHRONOUS MOTORS
1— 300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V. Totally Enclosed Fan Cooled Outdoor Service.

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1—1000 KW G.E., 600 V, 514 RPM, 4600V Syn.
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1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 100 KW El. Mchy. 125V, 1200 RPM 4150V Syn.
2— 40 KW El. Mchy., 125V, 1200 RPM, 440 S.C.

SLIP RING MOTORS
1—2500 HP G.E., MT, 257 RPM, 6600V.
1— 250 HP West., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER
1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR

A New Word for Capitalism

To the Editor:

Capitalism?

We were constituted a republic by the founding fathers and they defined our form of government as they understood the definition of a republic at that time.

At no time was democracy seriously thought of or considered. Only recently have we come to rename a system of government that did so much for us and, in doing so, have placed it on the way to becoming what it is named.

As you point out in your editorial in "Electrical World" June 4th, we have grown great as a capitalistic nation. Do we need to satisfy the Communists and Socialists as you suggest?

I have been sorry that Editor Nicols does not use his wisdom to discuss the correction needed in our system rather than try to induce the thoughtless to believe we are changing the system by changing the name. . .

W. S. Judy

The Ohio Power Co
Bellaire, Ohio

To the Editor:

As a substitute for the word "capitalism" I would suggest the word "americanism." . . . . "Americanistic" sounds equally well (as a substitute) for the word "capitalistic." When you think of capital it is natural to think of U.S.A., but foreign propaganda works wonders.

F. W. Orendorff

Longmire, Wash.

To the Editor:

In your search for a word to replace "capitalism" as a one word description of our system of enterprise and government, why not use the words "profit system"?

In the last few years the word "profit" has come to bear even a greater stigma than the word "capitalism" and for no sensible reason.

We—all of us from the ditch digger to the corporation president—are dependent upon profits for the continuation of our existence. When profits cease to be, jobs cease to be, and the end is in "socialism" or some other vague and undefined "ism." Let us get away from all "isms" including "capitalism."

All enterprise or activity—be it that of an individual or of a giant industrial enterprise—seeks but one thing, basically, and that is profit. The worker by means of a bigger paycheck, the stock holder by larger dividends. Is there then anything so unholy or wrong in calling our system simply the "profit system" when everyone profits by the very fact of its existence?

Business is founded and exists but for one reason—profits. Government is made possible as a continuing system of checks and balance by the taxes it collects from the profits of the business system.

Let us come out in the open and face reality. Let us stop referring to profits as something to be ashamed of or to be hidden or apologized for. Let us be proud of our "profit system" for what we know it to be: The producer and the champion of the highest standard of living ever achieved by civilized man, the producer of democratic government where free speech and the right of assembly is a part and parcel of the "profit system."

I say let us call our system for what it is. By the only name that properly describes it, the only motive that activates any function or group. Let us stand before the world and proudly proclaim it, and fight to protect and maintain it!

Kenneth R. Miller
Sales Manager

Preformed Line Products Co
5349 St. Clair Ave
Cleveland 3, Ohio

To the Editor:

A new word for "capitalism"? Why not "citizen ownership"?

G. J. Pierre

510 Harding Ave
Detroit 14, Mich.

To the Editor:

It was with a feeling of dismay that I read in the June 4th issue of "Electrical World" that you favor aiding William I. Nichols, editor of "This Week" magazine, in a search for a new word for "capitalism" just because the naughty Socialists and Communists hurl nasty accusations at it. I suppose we should find a new word for "man" because some are corrupt.

As far as I can determine, there are two short definitions of capitalism:

1. Economic system based on private property, competition, and the production of goods for profit;

2. Concentration of wealth, power, and influence in the hands of a few.

In America, fortunately, capitalism has tended to follow most nearly the first definition, at the same time tending away from exploitation and toward better living conditions.

In Europe and elsewhere, unfortunately, the tendency has been toward concentration of power.

The two systems are, nevertheless, capitalism, and we cannot make ourselves any the less capitalists by adopting a different name. Our task, it seems to me, is to publicize the form capitalism has taken in the United States and to contrast it with capitalism elsewhere. Just as we admit that there can be good men and bad, let us show that capitalism can be and is good.

This can be best accomplished by continually working at improving our system and correcting our faults, at the same time improving our international relations by fair, firm, realistic dealings with those of other nations. This applies to both private and governmental organizations. The only concession I would make to Mr. Nichol's line of reasoning would be to call our form of capitalism "American Capitalism." Let's stop being afraid of being called names!

Herbert E. Edelstein,
Professional Engineer

609 West 196th St
New York, N. Y.

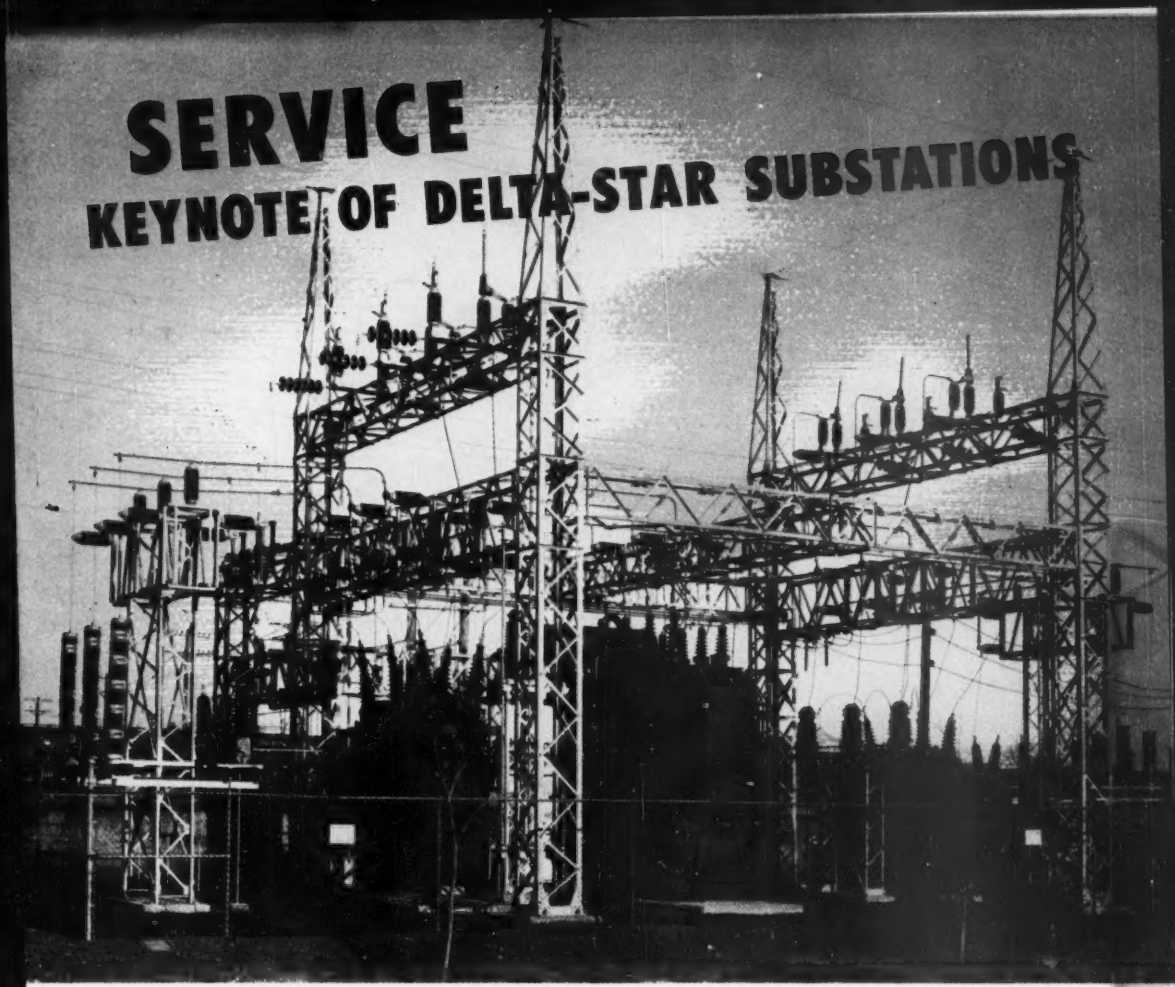

Photo Courtesy Montana-Dakota Utilities Company.

Repeat business from hundreds of purchasers who have installed thousands of Delta-Star substations during the past thirty years is ample proof that our customers like the kind of service they get.

Delta-Star's long experience in manufacturing substations has resulted in a standardized system of handling which reduces the time required for planning, fabrication and shipment to a minimum. Component parts for equipment are in stock ready for assembly. Structural steel is accurately cut and punched, then hot-dip galvanized under precise control in our own shops. Careful checking and marking before shipment insures a "custom" fit. Every detail from anchor bolts to switching equipment is covered by drawings in the construction folder to facilitate easy and speedy erection.

We will gladly consult with you on your substation requirements for any voltage rating and submit information on design, cost and delivery. All you need do is send us a sketch or one-line diagram of your proposed installation together with pertinent information such as ground space available, arrangement and height of circuits and other special requirements. We are sure you will be pleased with the results.

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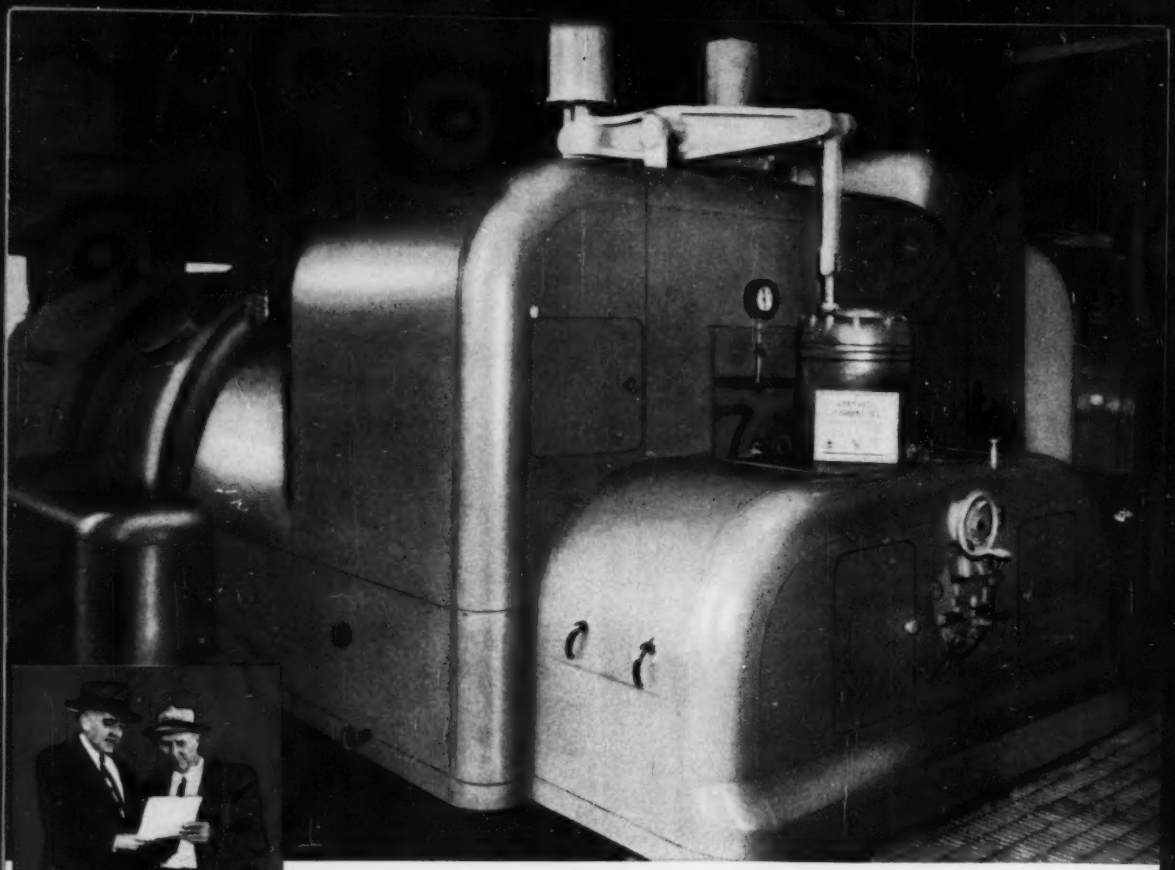

One (good) thing leads to another

at Coffeyville, Kansas Al Manis, superintendent of the Coffeyville municipal power plant, and Standard Oil (Indiana) lubrication specialist Thomas R. Smith, review the latest report on NONPAREIL Turbine Oil in service in the 10,000-KW turbine above. The neutralization number: 0.04 mg. KOH/gm.

Low acidity was one of the advantages Coffeyville engineers counted on in specifying NONPAREIL when this turbine was installed in June, 1949. NONPAREIL already had shown its resistance to deterioration, its freedom from deposits, and its elimination of acidity troubles, in the municipality's 5,000-KW turbine where it has been in service since 1945. The performance record on this first unit . . . a record including no oil replacement, no necessity to remove the oil for treatment, no downtime for cleaning of the oil system . . . was reason enough for insisting on NONPAREIL in the second turbine.

Consider what a similar lubrication performance record can mean to your own operating and maintenance costs. Consider too, that NONPAREIL Turbine Oil is guaranteed in writing to last as long as your turbine. Its neutralization number is guaranteed never to exceed 0.15 mg. KOH/gm.

For details on NONPAREIL Turbine Oil as applied to *your* turbine installation, and case studies showing the results of up to 23 years continuous trouble-free operation of NONPAREIL in other installations, call for the services of your Standard Oil lubrication specialist. You can reach him at your local Standard Oil Company (Indiana) office, or write: Standard Oil Company (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

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